SHIP PRODUCTION COMMITTEE
FACILITIES AND ENVIRONMENTAL EFFECTS
SURFACE PREPARATION AND COATINGS
DESIGN/PRODUCTION INTEGRATION
HUMAN RESOURCE INNOVATION
MARINE INDUSTRY STANDARDS
WELDING
INDUSTRIAL ENGINEERING
EDUCATION AND TRAINING

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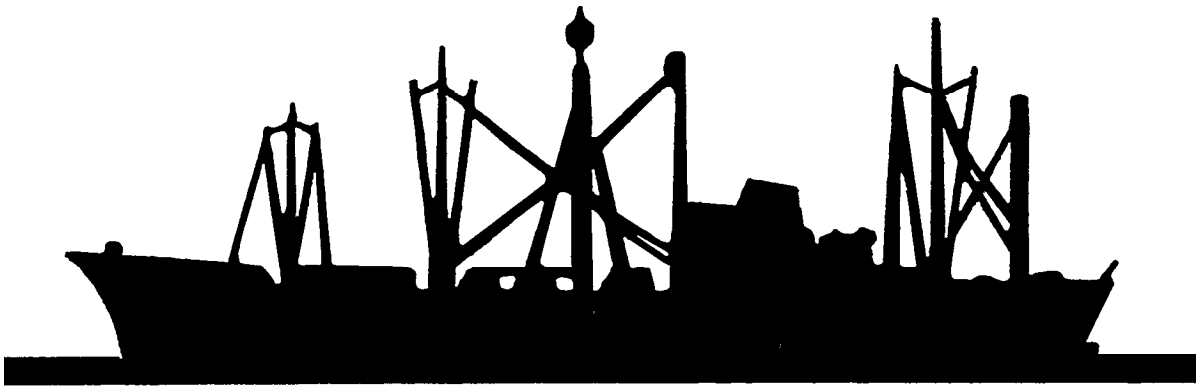

INSTITUTE FOR RESEARCH AND ENGINEERING FOR AUTOMATION AND PRODUCTIVITY IN SHIPBUILDING

IREAPS

SHIP PRODUCTION COMMITTEE OVERVIEW

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Chairman, Ship Production Committee
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I believe "Ship Production Committee (SPC) Overview" needs a little explanation. The SPC, approximately 9 years old, was formed under SNAME Technical & Research Steering Committee and funded by MarAd with some cost sharing by industry. The purpose, to improve productivity in U.S. shipbuilding. This to help U.S. shipyards reduce their costs, make MarAd subsidies less and with the hope of the U.S. being more competitive in the world market. Much headway has been made.

Our projects are published as National Shipbuilding Research Projects. As Chairman of the SPC, we and REAPS thought it would be educational to this symposium to share an overview of our research projects plus the new Panels, SP-4 - Design/Production Integration and SP-9 - Education.

The SPC started with just shipyards. However we soon recognized the need to add others: USCG, USN, ABS, along with our sponsor, MarAd. We recently added design agents and educational people, who train our future marine people, to our membership.

You will be hearing from our program managers on their projects shortly. We have many cost saving projects. They need to be implemented. We are also sponsoring workshops to teach shipbuilding the better way. The program managers will explain.

We are now coordinating with Navy representatives here as well as MarAd. Cooperation between commercial and Navy ships material and equipment needs can make standards work and save dollars for both. Our SPC interfaces with the Navy Manufacturing Technology group and CAD-CAM so we share information and do not duplicate programs. We plan to spend taxpayer's money wisely for they are us.

SP-2 - OUTFITTING AND PRODUCTION AIDS

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ABSTRACT

SNAME Panel SP-2 initiatives started the now massive transfers of Ishikawajima-Harima Heavy Industries Co., Ltd. (IHI) technology to the U.S. shipbuilding industry. Further, the Panel has continued to participate in systematically extracting more knowledge about the very competitive IHI methods. The projects completed, underway and proposed would, in the absence of guidance be differently assimilated by individuals because of parochial interests. More so than anything else, the National Shipbuilding Research Program publication "Product Work Breakdown Structure-November 1980" provides awareness of how seemingly unassociated Panel SP-2 and other projects are critically related. A senior manager of a large U.S. shipbuilding firm stated: "Without such awareness we will continue to suffer from suboptimal efforts from well-intentioned middle managers trying to incorporate new ideas piecemeal from the bottom up without any recognized overall framework for change."

Traditionalists retard development of shipbuilding methods in the U.S. when they continue to refer to superior Japanese work ethic, facilities, etc. There are surprises in store for them if they address differences in management methods. One surprise is that the product (or zone) oriented methods which characterize shipbuilding in Japan are largely American in origin. Much can be traced to Henry Kaiser, the industrialist who set unprecedented shipbuilding records during World War II. Much was brought to Japan in 1951 by Elmer C. Hann, a former Kaiser shipyard manager.[1] During the next two decades, when it was Japanese national purpose to be foremost in shipbuilding, these methods were continuously developed and repetitively applied and proven in old shipyards, virtually all of which escaped destruction during World War II.2

Even the idea to publish Product Work Breakdown Structure (PWBS) is American.[3] The Panel SP-2 research specification fixed the scope, established the relationship with the logic and principles of Group Technology (GT) and provided critical definitions, e.g.:

- A work breakdown structure identifies interim products and their relationships to each other that are necessary for defining and constructing an end product, i.e., a ship or other entity.
- An interim product is a discrete element identified as an objective in a work package. It is a part, subassembly, zone, system, etc. that has been transformed by the application of work.

This emphasis caused the shipbuilding engineers, from Ishikawajima-Harima Heavy Industries Co., Ltd. (IHI) of Japan, who contributed to PWBS to concentrate on their methods for devising ideal interim products. These, when matched to preferred classifications by zone, problem area and stage are much of "... the logical arrangement and sequences of all facets of company operations in order to bring the benefits of mass production to high variety,

mixed quantity production."[4] This is Group Technology. In a manner of speaking, their expertise is in planning, scheduling and producing interim products; the ship as an entity is incidental. To them, standard-series interim products, i.e., unchanged in problem area and work content regardless of design differences, are more important than standard-series ships.

At this time, the best overall framework of IHI methods is PWBS and it exists only in English. It is the "Rosetta stone" which facilitates shipbuilders' understandings of how insufficient coordination of different functions is the greatest cause of inefficiency in any industrial enterprise. Even IHI people regard PWBS with awe. They are now considering translating it into Japanese, undoubtedly to facilitate training their next generation of shipbuilding engineers and also to facilitate transition to automated shipyards.5

The Achilles' heel of the U.S. shipbuilding industry has been identified by Dr. H. Shinto[6] as not enough middle managers who can think analytically about industrial engineering matters. Such people, really shipbuilding engineers preoccupied with interim products, are necessary for coordinating the various material procurement, fabrication and assembly disciplines that characterize shipbuilding. Abilities to integrate hull construction, outfitting and painting, as described in PWBS are now prerequisite for shipbuilders everywhere. There are no other practical options because the current politico-economic climate is characterized by:

- conviction that subsidy insulates from competition, diminishes efficiency, and adversely impacts on long-run performance, and
- inflation and high interest rates focusing attention on minimizing time between contract award and delivery.

Citing pertinent actions by Avondale Shipyards, Inc. in mid-1979 and subsequent progress of integrated processes, a government official expressed the opinion that no other U.S. shipbuilding firm can afford to remain static.

They too must exploit the Japanese shipbuilding technologies, such as PWBS, which Maritime Administration initiatives are making available through the National Shipbuilding Research Program.

Similarly, the U.S. Navy has no other option if it is to avoid further arousing public skepticism of its ability to manage shipbuilding affairs. By any measure, such non-confidence has impaired naval readiness more than even the 7 December 1941 attack on Pearl Harbor. For example, recent criticisms associated with Trident class submarines are not new. Comments such as "... shocking cost overruns . . . and changing specifications while a vessel was being built . . ." have been continuously newsworthy for over a decade.7 In readiness terms, cost overruns and late deliveries are the equivalents of ships damaged or sunk!

Department of Defense (DOD) Instruction 7000.2 advises shipbuilders to "... be continuously alert to advances in management control systems . . ." It **does not** require ". . . the use of any single system . . ." Thus, the initiative is open to shipbuilders! Also, the DOD instruction defines a work breakdown structure as: "A product-oriented family tree division of . . . work tasks which . . . define the product to be produced **as well as the work to be accomplished. . ."** The Navy's Ship Work Breakdown Structure (SWBS) does not fulfill this definition because it is system oriented. Neither does it conform with current U.S. shipbuilding methods nor with the world's most productive methods. Thus, the Navy itself is impeding implementation of advances in management control systems!

Further, the Navy's SWBS is not consistent with the logic and principles of Group Technology. 'PWBS adapted for building naval ships, would conform with the DOD definition and, as proven in Japan, is extremely effective for applying Group Technology to shipbuilding operations.

The Navy, Iike commercial shipbuilders, must forgo traditional methods for the expanded naval shipbuilding program currently planned. Naval officials are well advised to de-emphasize their overbearing bureaucracies[8,9] and substitute encouragement, if not requirement, for shipbuilders to adopt a product-oriented work breakdown structure as a framework for change. Precedents for applications in navaI shipbuilding exist not only in Japan, but also as applied in Avondale for integrated hull construction, outfitting and painting of naval tanker pump-rooms.

A productive shipbuilding industry is an indispensable element of seapower.

Footnotes

[1]Mr. Elmer C. Hann is currently Vice President, Far Eastern Operations of National Bulk Carriers, Inc. In early 1941 he was the second shipbuilder to join Kaiser at the latter's Richmond No. 1 yard. There he was Hull Superintendent during construction of Thompson Sands vessels for the British. Later during World War II, as General Superintendent in Kaiser's Swan Island shipyard, he had all responsibilities for building the then, very sophisticated T-2 tankers. Mr. Hann was presented with the Order of the Chrysanthemum by the Emperor for outstanding contributions to the Japanese shipbuilding industry.

[2]"Japan's Phenominal Shipbuilders" by Admiral S. Nakayama, Japan Maritime Self-Defense Force (Retired) and M. Chihaya, U.S. Naval Institute Proceedings, August 1966, pp. 27-39.

[3]"A Study of Shipbuilding Cost Estimating Methodology" for the Maritime Administration by Engineering & Management Sciences Corporation. dated 20 January 1969.

[4]"Group Technology: A Foundation for Better Total Company Operations", by G.M. Ranson, McGraw-Hill, London, 1972, p. 1.

[5]"Shinto's Proposal on Building of Next Generation Ships", Zosen, Tokyo News Service, Ltd., March 1981, p. 17.

[6]Believed by many to be the world's foremost shipbuilding engineer, Dr. H. Shinto graduated from Kyushu Imperial University in 1934. He then entered Harima Shipbuilding & Engineering Co., Ltd. In 1951 he joined National Bulk Carriers, Corp. which had just leased the former naval dockyard in Kure, Japan. In 1960 he became Managing Director of IHI and Manager of the Shipbuilding Division. He was nominated as Executive Vice President of IHI in 1964, then as President in 1972. A consultant for two years after retirement, Dr. Shinto was recently appointed by his Prime Minister as President, Nippon Telephone & Telegraph Corp.

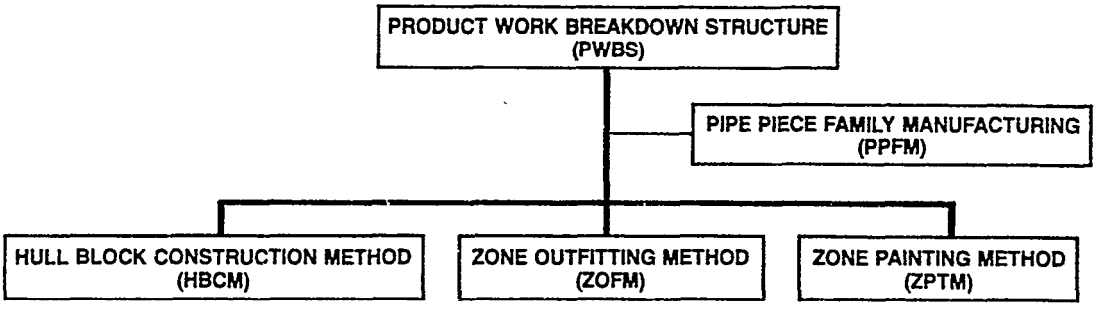
[7]TIME, 21 November 1969.

[8]1n the early sixties, seven people were assigned to a Navy resident office during peak construction of guided-missile destroyers (DDG). The shipbuilder did not then have a quality assurance (QA) staff. Since then, the Navy shifted to a surveillance-inspection policy for its own people and simultaneously required the shipbuilder to maintain a QA staff. Recently, for ships (FFG) having similar shipbuilding-problem areas and a production-work rate that peaked at a little more than threefold, the same Navy resident office grew to about sixty people while the shipbuilder had sixty-five assigned to QA.

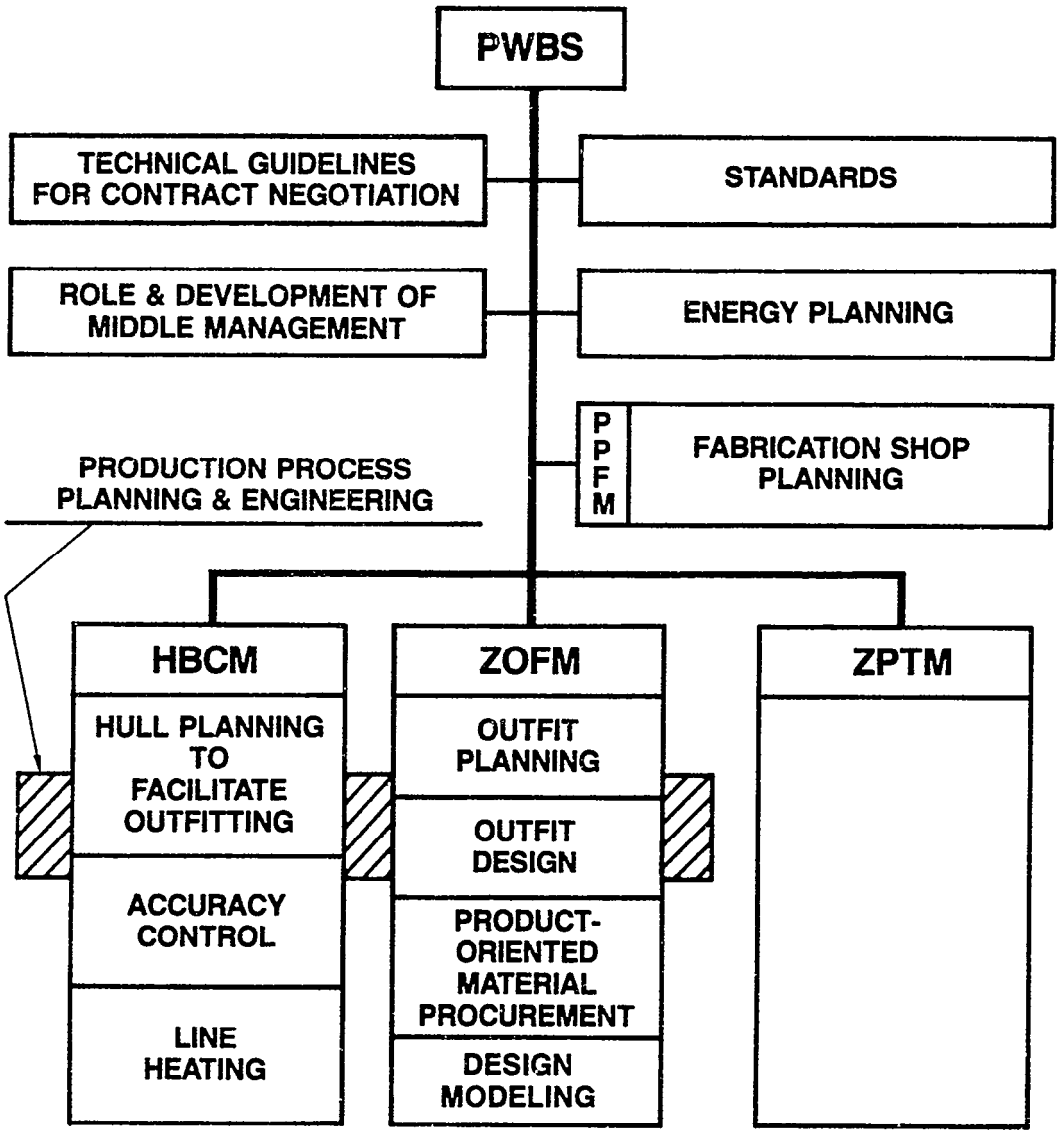
[9]"Navy Shipbuilding: Building Ships or Bureaucracies?" by Commander Louis D. Chirillo, U.S. Navy (Retired), U.S. Naval Institute Proceedings, August 1975, pp. 38-45.

APPENDIX

Summary of Panel SP-2 and Related Projects



Product Work Breakdown Structure (PWBS) applies to any industrial process. As developed for shipbuilding, it features three basic methods. Each addresses a distinct type of work. As all are zone/problem-area/stage oriented, they can be readily integrated. Also, they facilitate real and virtual flow processes in accordance with the principles of Group Technology. A fourth supporting method which is problem-area/stage oriented, facilitates the application of Group Technology for fabricating parts such as pipe pieces.



A number of subjects being addressed by the National Shipbuilding Research Program derive from Product Work Breakdown Structure (PWBS). None require investment in facilities!

Hull Block Construction Method (HBCM)

- Hull Planning to Facilitate Outfitting-US. shipbuilders are confronted with the need to wean traditionalists from the premise that ". . . ready for outfitting dates must first be met in the hull production area." This is because the most competitive shipbuilders have proven that it is possible to devise blocks that facilitate outfitting and painting while at the same time applying Group Technology to hull parts, sub-blocks and blocks in order to achieve the benefits of both real and virtual flow lanes. A book is being prepared which should reorient hull-construction planners and teach outfit and painting planners hull-construction options.
- Accuracy Control-A common problem encountered in shipbuilding is difficulty in joining hull blocks during erection due to inaccuracies such as in overall dimensions and misalignment of structural members. Considerable time and labor is needed to correct such errors. Moreover, their correction at the erection site is not conducive to safety. The science of Accuracy Control is applied by foremost shipbuilders to curtail errors in each work process, i.e., preparing templates, marking, cutting, fitting, welding, etc. The accumulated error at the erection stage is limited within a tolerance which assures structural integrity Also, Accuracy Control is a means of controlling the amount of work performed at each stage so that none is arbitrarily passed downstream where it would disrupt real or virtual flow lanes. For this reason and because there is considerably less rework, productivity is enhanced. A book is being prepared which addresses: importance, approach, errors in each process, merger of errors, applications in production, related jobs and practical suggestions.
- Line Heating (Flame Bending)-The ability to form extraordinary shapes by heating and cooling has been developed and applied as a science by leading shipbuilders. It is employed as an adjunct to Accuracy Control. It features: less need to invest in facilities, improved accuracy and enhanced productivity when combined with the use of presses and rollers. Further, line heating is applied at all manufacturing levels, e.g., for parts, sub-blocks and blocks in order to correct distortion. An illustrative publication is being prepared which will describe effects on accuracy, principles and applications.

Zone Outfitting Method (ZOFM)

- Qutfit Planning-Published in December 1979, it fulfilled its objective to ". . . record optimum outfit planning techniques in order to facilitate the training of new outfit planners and a better understanding of outfit requirements by other shipyard functionaries." It introduced zone outfitting, as distinguished from less efficient preoutfitting, pertinent terminology and design methods, and described the reliance on material control which impacts on the organizations in the world's most effective shipyards.
- Outfit Design-Methods used by the foremost shipbuilders are known to be based upon the principles of Group Techno!ogy and to have produced tremendous benefits even without new facilities. They require more designer understanding of fabrication and assembly methods so that virtually all planning can be included in work instruction drawings and their structured material lists. The objective of this project is to describe the II-II methods, which in some instances have reduced design manhours required to ¼ of those required by traditionalists. It will also describe techniques used for accelerating material requirements definition (70% defined at 30% design completion) and minimizing the overall design time required. Concepts such as the use of standards, design modules, etc. that were introduced in "Outfit Planning-December 1979" will be more thoroughly describe.

- Product-oriented Material Procurement-For the procurement of outfit materials, leading shipbuilders have developed suppliers and subcontractors that efficiently function as extensions of their shipyards. Because of certain arrangements there is mutual understanding of each other's needs so that many small supplier and subcontractor organizations effectively assist shipyards to maintain standards and inventories and by performing painting and palletizing, i.e., the delivery of material by zone requirements. As U.S. shipbuilders have started the shift to zone-oriented methods, there is need to advise them of effective zone-oriented material procurement techniques.
- Design Modeling-Shipbuilders throughout the world have developed design modeling as a simplified means for creating the detail design of a complicated machinery space such as a ship's engine-room. They were motivated by the decline in experience levels of the people available. Moreover, recent research has disclosed a practical photogrammetric method for obtaining 3-dimensional coordinates from a model for direct entry into a computer. Thus, three "tools" are now available to detail designers, each of which is uniquely productive when certain conditions exist. More has to be described about design modeling so that shipbuilders may better select one or a combination of the design-method alternatives.

Zone Painting Method (ZPTM)

- Panel O-23-1 has cognizance.-Attention should be focused on changes in current painting specifications in order to permit zone-by-stage control, i.e., integration of painting with hull construction (HBCM) and outfitting (ZOFM). The benefits are safer working conditions, minimization of staging, more even distribution of painting manhours over an entire shipbuilding project and better productivity.

Related to HBCM, ZOFM and ZPTM

- Production Process Planning & Engineering-Other research, particularly that which produced "Product Work Breakdown Structure-November 1980", proved that the most productive shipbuilding methods are primarily based upon the use of Group Technology. The very effective IHI production process planning and engineering is commonly associated only with the world's first rationalized shipyard, IHI Yokohama opened in 1964, and newer shipyards. However, they are also applied in two older IHI yards, Kure (1903) and Aioi (1913), to the extent that both are among the world leaders particularly for a mix of outfit-intensive ships. Thus, the objective of this research is to describe pertinent methods, particularly the interaction between field engineers and designers, which maintain coordinated and uniformly loaded, virtual and real process flows.
- Contract Negotiation of Technical Matters-There are various technical matters in addition to contract design that are of mutual concern to a shipbuilder and ship buyer. These at least include:
  - building methods (HBCM, ZOFM, ZPTM & PPFM), shipyard practices (standards) and major items of a painting schedule,
  - design methods (standards),
  - list of major materials to be furnished by suppliers,
  - list of drawings for buyer's approvals,
  - inspection standards and procedures, and
  - progress reporting methods.

One U.S. shipyard has already completed a successful negotiation with a buyer as described in the foregoing and reported that real progress upon contract award "... was about four months ahead of where they would have been otherwise." U.S. shipbuilders need more information about such negotiations which some of their customers already encountered when they had ships built abroad.

- Role & Development of Middle Management-Dr. H. Shinto, widely recognized as the world's foremost shipbuilding engineer, has identified the lack of college educated, or equivalent, middle management as the singular reason why U.S. shipbuilders' productivity is significantly less than that of their counterparts in Japan. In the organization for shipyards as developed for Ishikawajima-Harima Heavy Industries Co., Ltd. by Dr. Shinto, people having achieved college level proficiencies in various disciplines (i.e., not only in naval architecture & marine engineering) are assigned systematically in accordance with certain career patterns. The objective is to fully develop them as shipbuilding engineers, i.e., industrial engineers who specialize in the development and execution of material procurement, fabrication and assembly matters that characterize shipbuilding. Such people are rotated in various positions of responsibility including the management of fabrication shops and assembly sections. Thus, they appreciate the interdependence of different kinds of work and have as a consequence, developed extremely competitive, integrated hull construction, outfitting and painting. The end product will be a book which will recommend career patterns for managerial people in U.S. shipyards. It will at least include educational and/or experience prerequisites, career alternatives (e.g., in design vs. in production) and prerequisite job experiences for specific assignments at specific managerial levels.

- Standards-Panel SP-6 has cognizance. This effort is important to SP-2 activities because Panel SP-6 has redirected its' research to take advantage of IHI's extraordinary methods for classifying and maintaining standards. Much of the implementation of Panel SP-2 end products will be facilitated when shipbuilders exploit standards beyond those which apply to just material items, i.e., for reusable machinery arrangements, design modules, patterns and panels as described in "Outfit Planning-December 1979".

- Energy Planning-The objective of this project is to facilitate shipbuilders' determinations of cost effective energy conservation techniques for fabrication and assembly processes. A specific goal is a set of energy indices analogous to those used for monitoring manhours as shown in "Product Work Breakdown Structure-November 1980" (Figure 54) broken down by classes of interim products. These could be energy-units/month consumed per fabricated parts weight, per subassembly weight, per subassembly welding parameter, etc. As monitoring all may not be practical, the objective includes some qualified way to apportion energy metered at a single location to various manufacturing levels or work stages. This research could make it practical to consider the energy required per work package as another means for determining its productivity value.

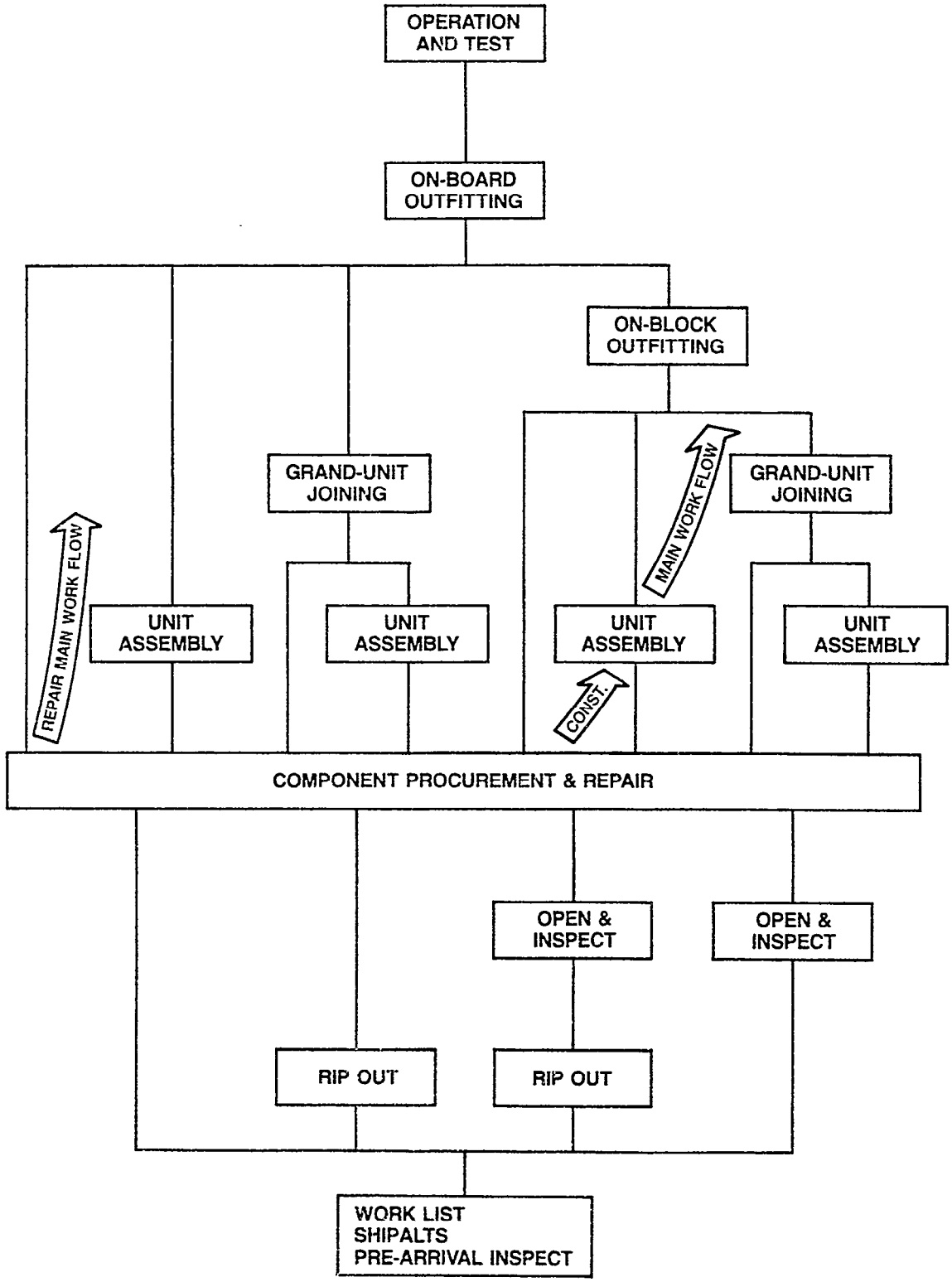
Pipe Piece Family Manufacturing (PPFM)

- Fabrication-Shop Planning-This work, although being performed in the context of pipe-piece manufacturing, should be useful for any other shop's work provided it features high variety, mixed quantity production. The project's goal is to elaborate on information contained in "Outfit Planning-December 1979" (Figures 2-13, 2-14, 2-17 and 2-18). Addressing shop managers, their field

engineers and designers, it will show how piece identities and their classifications for family manufacturing assigned by designers are linked to assembly work packages through material lists. It will suggest problem area, i.e., family, classifications that designers should consider. Thus, it will encourage structured material lists as the means for ordering material and performing fabrication by lots per family even for different systems in different ships being constructed simultaneously. In other words the project addresses Group Technology applied to a fabrication shop.

Suggested Future Projects

- Product Work Breakdown Structure (PWBS) for Ship Repair-The unqualified success of zone-by-problem-area-by-stage control for outfitting suggest applicability to ship repair. During an October 1980 interview, Dr. H. Shinto confirmed applicability provided the overhauls are large enough to "...justify engineering involvement." Certainly in the U.S., overhauls of most naval ships are large enough; some even exceed the costs for building commercial ships. Dr. Shinto specifically confirmed that PWBS has been applied to conversions such as when shifting from steam to diesel propulsion. Precedent exists in the form of application dictated by circumstances like in the congested sail-area of a modem submarine. Another, by a private ship-repair yard already featured zone-by-stage control of all trades in a congested pump room of a naval tanker. Precedent exists in a naval shipyard where recently a sponson was outfitted on-block before it was attached to an aircraft carrier.
- Indices for Monitoring Man-hours, Progress and Productivity-As shown in "Product Work Breakdown Structure-November 1980" (Figures 5-3 and 5-4) the effectiveness of PWBS is due primarily to the separation of fabrication shops and assembly organizations to match specific classes of interim products. The performance indicators employed are custom devised for each. Although those shown are more than what are customarily applied in the U.S., even more indices are used by IHI. For example, only two productivity indices are shown for Pipe Piece Family Manufacturing, i.e., manhours/manufactured weight and manhours/manufactured piece. These are known to be supplemented with pipe piece welding parameter/manhour and to be broken down by pipe-piece families. More such information would assist U.S. shipbuilders in identifying the costs that are normal for their work forces and facilities.


OPERATION AND TEST
ON-BOARD OUTFITTING
ON-BLOCK OUTFITTING
GRAND-UNIT JOINING
GRAND-UNIT JOINING
REPAIR MAIN WORK FLOW
MAIN WORK FLOW
UNIT ASSEMBLY
UNIT ASSEMBLY
UNIT ASSEMBLY
UNIT ASSEMBLY
CONST.
COMPONENT PROCUREMENT & REPAIR
OPEN & INSPECT
OPEN & INSPECT
RIP OUT
RIP OUT
WORK LIST
SHIPALTS
PRE-ARRIVAL INSPECT

SP-1/SP-3 - SHIPYARD FACILITIES AND ENVIRONMENTAL EFFECTS

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FACILITIES

The Ship Production Committee of the Society of Naval Architects and Marine Engineers re-activated Panel SP-1 Facilities July 20, 1978.

Avondale Shipyards Inc accepted the chairmanship and agreed to be the primary sponsor. Presently we have 21 active members from 17 shipyards plus MarAd representation.

During the July 1978 meeting of Panel SP-1 (Facilities) it was suggested that the panel develop a consensus specification for long-range facility plans. The purpose of the consensus specification is to provide a standard format and criteria for the development of facility plans. This would be a tool for use by MarAd and a specific shipyard in conjunction with the proposed facility modernization planning program.

A 5-day working conference was held in Atlanta Georgia. Twenty-two representatives from 12 major shipyards attended the 5-day conference and currently have a common approach for the development of long-range plans.

The second step of this effort was to prepare proposals, on a voluntary basis, for one or more shipyards to develop a long-range plan for their respective yard. The detailed proposals were submitted directly to MarAd.

Panel SP-1 (Facilities) currently has a three-phase objective emphasizing improved productivity.

Phase I - Enhance the Shipbuilding Industries Long-Range Facilities planning Efforts

Phase II - Determine a Feasible Method of Instituting a Cooperative High Risk Facilities Program

Phase III - Determine a Feasible Method of Instituting a Cooperative Facilities Modernization Program

Our efforts are directed toward achieving this three-phase objective, placing emphasis on cost effective producibility. Five shipyards are participating in the long-range facility planning effort.

LONG-RANGE FACILITIES PLAN STATUS

Shipyard	Mo/Yr Completion	Remarks
NASSCO	March 1982	
Todd, Louisiana	Completed	Final Report in work
Peterson Builders Inc	Requesting a time extension	
Newport News	MarAd Contracting in work	
Avondale Shipyards Inc	June 1982	

SUMMARY AVONDALE SHIPYARDS LONG RANGE FACILITY PLAN

The primary objective is to decrease the total time required from contract award to delivery of vessels, along with increasing our productivity so as to reduce cost.

A. Phase I: Long-Range Facility Plan

We have completed the technology evaluation. The Long-Range Facilities Plan is rescheduled for completion including integration of the technology survey during the month of June 1982.

B. Phase II: Implementation

The following itemized objectives provide the management mechanisms assuring proper implementation and application of the prioritized findings resulting from the technology evaluation. This implementation program is expected to be completely operational and put into effect on Avondale Shipyards, Exxon Contract.

1. Implement the IHI System of Accuracy Control at Avondale Shipyards Inc

2. Implement the IHI System of Production Planning at Avondale Shipyards Inc

3. Implement the IHI System of Computer Application at Avondale Shipyards Inc

4. Implement the IHI System of Design Engineering with Procurement Specifications at Avondale Shipyards Inc

C. Second Round Effort: Implement Process Lanes

As a second round effort, Avondale has submitted an abstract proposing the implementation of Process Lanes to MarAd for funding.

BACKGROUND AND PROGRESS

A. Phase I: Long-Range Facility Plan

Avondale's original proposal, which was submitted to Marad on May 23, 1979 we rescoped and resubmitted on June 27, 1979. The reason for resubmittal was based on the rough appraisal of Avondale Shipyards operations after studying the MEL Technology Survey, the Levingston/IHI Technology Transfer, Todd Shipyards outfit planning document and the Shipbuilding Industry's Concensus Specification for a long-range facility plan. Our study has indicated that to develop a long-range facility plan, we have to take advantage of all the technological data, which has been developed under the MarAd research program, because this would have direct - affect upon the long-range plan.

In June 1979, ASI requested and received a quotation for a survey of Avondale Shipyards Inc from IHI Marine Technology Inc. In July 1979, we entered into a contract with IHI to do the survey. April 22, 1980, we received a letter of Contract MA-80-SAC-01031, for a long-range facilities plan. September 26, 1980 we signed the contract with MarAd. We completed the technology evaluation and received a preliminary report from IHI October 1, 1979. Decisions presently being analyzed regarding pre-outfitting are influencing material flow and material handling. These factors impact the completion of our long-range facility plan. Based on these circumstances, we requested that the period of performance (Article II) of the contract be extended from June 16, 1981, to June 16, 1982.

B. Phase II: Implementation

After completion of the technology evaluation, the recommended improvements prioritized the implementation of the accuracy control, production planning, computer application systems, and design engineering for zone outfitting with procurement specifications for material to supply zone outfitting. December 28, 1979, we submitted our proposal to MarAd for implementation of the four items.

ASI has made schedule adjustments predicated on implementation and application of these four key management mechanisms. The Exxon contract will be used as a basis for measurement of improvement in our productivity and cost effectiveness. We anticipate an approximate 3 month flow time reduction from laying the keel to delivery date.

We awarded a subcontract to our consultant "IHI Marine Technology for the implementation effort before the formal contract was issued by MarAd. Avondale sent a team to Japan on August 4, 1979, to do an in-depth study of the IHI engineering and manufacturing methods. The on-site survey was started August 27, 1979, at our facility. We understand from Mr. Garvey that this project will be the first funded by cooperative agreement through the National Shipbuilding Research Program. We expect a definitive signed contract with MarAd in the near future.

C. Second Round Effort: Implement Process Lanes

Early in the technical evaluation, we determined the magnitude of the IHI recommendations. IHI had dedicated substantial time and effort since the end of World War II developing and refining their technology. We have concluded that Avondale, or any other shipyard, would derive significant improvements in productivity by the integration of this technology into their existing operations. Inasmuch as these approaches impact all functional operations in shipbuilding firm (customer, Coast Guard, Maritime Administration, vendors, etc), there remains considerable uncertainty as to the difficulty, costs and benefits of the applications proposed.

For this reason Avondale did not propose to implement all the IHI recommended changes at one time. Our criteria for a selection of a first-round implementation program considers many factors which in summary attempts to realize the most significant improvements in productivity with the least amount of disruption. After careful consideration Avondale proposes the implementation of Process Lanes as a second round effort.

PIPE SHOP

Approximately 5 years ago Avondale started a feasibility study of a semi-automatic pipe handling system and fabrication facility due to the high cost of ship piping systems. This project, it turns out, will be a major management improvement as well as a cost improvement package. In developing this study we determined that a major change must be made in our method of designing piping as well as in our shop management program.

During the development of the shop management program, which is required to fully implement the pipe shop project, our Data Processing Department investigated various programs that could be utilized without major development cost. The COPICS provided scheduling systems which can include: business planning, production planning, etc.

The study revealed that through automation a percentage of the required man-hours can be reduced in the following functions: handling, 68%; fitting, 55%; welding, 35%; cleaning, 79%; and coating, 86%. These percentages are based on LASH vessel construction since all basic data are applicable to this series of ships. An overall percentage reduction in fabrication man-hours equates to approximately 39.8% per ship (note 30,000 man-hours/l46,000 dwt tanker). We held a facility demonstration of the pipe shop and software during the April 1981 Ship Production Committee meeting at Avondale Shipyards.

MAJOR PRODUCTIVITY STUDIES IN PROGRESS CURRENTLY

MarAd has authorized Avondale to conduct a study concerning the economics of the installation of beam lines in shipyards. The beam line, for your information, would be capable of deflanging structurals, cutting all shapes, angles, beams and channels. The facility would be capable of processing 35,000 stock pieces per year on a two-shift basis for structurals and it would include marking with an accuracy of l/25 of an inch. Preliminary return on investment of this facility is extremely high; it appears that a 60% reduction in man-hours can be obtained with this system. Test cases that have been run on small units indicate that these results can be obtained.

Another MarAd project we are studying is a semi-automatic method to assist in the prefabrication, fabrication and assembly of webs, beams, floors, etc. The system provides a method which will reduce the labor, material handling, welding and space required for storage as well as manufacturing. The work within each functional area will be performed by use of adjustable jigging, welding gantries and other mechanical methods. Substantial emphasis will be directed toward automatic welding. Preliminary tests indicate a 43% reduction in man-hours with this system.

ENVIRONMENTAL

During 1979 we recommended that Panel SP-1 (Facilities)and SP-3 (Shipyard Environmental Effects) be combined into one panel. The logic being that the functional responsibility generally falls under the facilities department. We thought the combined panel would consolidate our industry's efforts regarding industry concensus input during the comment period of proposed federal regulations.

We coordinate our efforts with Shipbuilders Council of America Environmental Committee when dealing with governmental agencies such as the Environmental Protection Agency, the Department of Labor (OSHA), the U.S. Coast Guard, and the Department of the Navy. The shipyards, on an individual basis, have to address their respective state and local regulatory agencies to meet the intent of their regulations.

During the proposal period, part of our commitment is to ensure that the regulations are feasible regarding compliance as well as cost effectiveness. We have submitted comments to regulatory bodies as well as conducted independent studies to establish guidelines for use in the development of cost effective regulations.

We have focused on such issues as: (1) draft development document for the shipbuilding and repair industry drydock points source category; (2) methods of receiving sewage from vessels using drydock facilities; (3) programs for complying with National Pollutant Discharge Elimination Standard Permit requirements; (4) penalties for violation of Federal Water Pollution Control Act (FWPCA); (5) certificates for financial responsibility; and (6) the OSHA blasting standard development document.

During the recent past the shipbuilding and repair industry through Panel SP-1 (SNAME) and the Environmental Committee of SCA have focused our attention on hydrocarbon emissions. Several approaches have been considered; changing the solvent, inhibiting the photochemical rectivity (Rule 66 Calif), developing high solid coatings, developing water base coatings, utilizing carbon absorption and/or incineration. Carbon absorption or incineration can provide 90% emission control, however, the cost impact is prohibitive. In most cases, this type of emission control could cost as much as the paint

building. During the past 3 to 5 years most military specifications and commercial paints comply with Rule 66. It must be noted that the shipbuilding and repair industry uses the paint specified by the owners in most cases.

Panel 023-l of SNAME Ship Production Committee has accomplished substantial gains in the use of high-solid low-solvent coating. This industry effort is over and above Rule 66 compliance. Research and development of effective water base coatings for ships is being conducted. Under the Reagan Administration the volume of proposed regulation has definitely declined. Most shipyards are occupied with compliance to existing regulations in such areas as the consolidated NPDES Permits, RCRA; Hazardous Waste, Hazardous Material, Individual approaches regarding filing as a transporter, generator, treater, disposer and storage of Hazardous Waste. SP-1 will continue to keep abreast of regulatory change which may adversely influence the shipbuilding and repair industry.

A PROGRESS REPORT ON THE IREAPS PROGRAM

Edmund R. Bangs
IREAPS Program Manager
IIT Research Institute
Chicago, Illinois

The Institute for Research and Engineering for Automation and Productivity in Shipbuilding (IREAPS) is an organization which conducts an industry/government cooperative program for enhancing U.S. shipbuilding capabilities through development and implementation of improved systems and manufacturing technology.

PROGRAM ACTIVITIES

The primary thrust of the IREAPS program is the conduct of research and development projects for a variety of design and production processes in the shipyard. Such projects are initiated and pursued only upon consensus of the participating organizations and are not considered complete or successful until they have been implemented under actual shipyard production conditions. Services for participants provided by IREAPS through a technical manager include:

- Technology Assessment--periodic appraisals of the latest technologies in a variety of industries for application to current problems in U.S. shipbuilding processes.
- Technical Support--technical assistance to participating organizations in implementation use, modification, and maintenance of IREAPS developments.
- Technical Information Services--through the IREAPS Shipbuilding Technology Library an extensive collection of related literature and computer software is made available to the participating organizations.

Additional IREAPS services provided to the entire shipbuilding community include:

- IREAPS Technology Bulletin--a periodic synopsis of articles appearing in worldwide publications of interest to the shipbuilding community. IREAPS participants may order copies of cited articles free of charge; others at cost.

- IREAPS Technical Symposium--an annual symposium providing the industry with a single forum for gathering information through formal technical presentations on the state of the art. All are invited. The registration fee is waived for IREAPS participants.

IREAPS PROJECTS

IREAPS-sponsored projects are initiated and pursued under the following scenario.

- The participating organizations:
  - Identify common problem areas
  - Recommend specific R&D projects to address these areas
  - Monitor ongoing projects
- The U.S. Maritime Administration (MarAd) and other Government agencies:
  - Provide financial support to IREAPS participants on a cost-sharing basis; or other contractors, for the development projects.
- The IIT Research Institute (IITRI):
  - Serves as technical manager.
  - Provides technical and administrative services for the IREAPS participants to assure smooth functioning of the program.
  - Conducts selected developments specified by the IREAPS participants.

Current project status is summarized in the accompanying table.

ORGANIZATION

IREAPS is an independent not-for-profit membership corporation founded in April 1981 to direct the g-year-old REAPS program. The Institute was formed for the purpose of providing a vehicle through which the REAPS program participants could assume an increasingly active role in establishing and broadening the program agenda and directing its operation, as well as raising the level of the program visibility within each organization. Personnel from each IREAPS organization participate in:

- The Board of Directors--meets at least once a year to develop program policy and direction.

IREAPS PROJECT STATUS

PROJECT	DESCRIPTION	DEVELOPER	SCHEDULED COMPLETION	IMPLEMENTATION FOLLOW-ON
HULL DEFINITION FAIRING	Adapt to commercial use and document a Navy developed program for hull surface definition. Perform program evaluation.	NNS&DD& CONTRACTOR	COMPLETE	Workshop August 1978. Used in production at BIW, NNS, McDermott, Peterson, General Dynamics and Sun Ship.
N/C FRAME BENDING MACHINE	Develop and demonstrate a fully automated CNC frame bending machine.	MarAd/NSF CONTRACTOR	COMPLETE	Full capability and installation at NASSCO.
DAMAGED STABILITY PROGRAM	Develop and document computer programs to perform damaged stability analysis of ship and non-ship forms.	BETHLEHEM	COMPLETE	Workshop Dec. 1977. Used in production at Beth Ship.
COLD TWIST FORMING OF STRUCTURAL SHAPES	Demonstrate the feasibility of twisting structural shapes cold using inexpensive dies in a hydraulic press.	IITRI	COMPLETE	Full capability being fabricated at NNS for production use.
GRAPHICS AND COMMUNICATIONS TERMINAL	Develop software to allow minicomputer-based system to concurrently verify N/C "tapes" and perform remote computer communications.	IITRI	COMPLETE	Installed for production use at Beth. Steel & BIW.
PIPE DETAILING (RAPID) SYSTEM	Minicomputer-based system for digitizing piping systems to produce fabrication instruction, bill of materials and shop sketch.	NNS&DD	COMPLETE	Workshop Fall 1979. To be applied in production at NNS.
'ARTS DEFINITION SYSTEM	Develop an interactive graphics system to support the definition of structural parts at a CRT. Interactive nesting and the generation of shop drawings.	NNS&DD	FEB. 1982	
COMPUTER ASSISTED COST ESTIMATING	Develop an estimating methodology which makes use of computer assistance and demonstrate its feasibility.	NASSCO	JAN. 1982	
PRODUCT INFORMATION SYSTEM -ASK 1 STRUCTURAL INFOR-MATION REQUIREMENTS SPECIFICATIONS	Develop a list of information requirements dictated by engineering design planning and production functions for structure use in the design of a structural database.	IITRI NNS&DD BATH PETERSON NASSCO	APR. 1982	
INTEGRATED HULL FORM DESIGN	The objectives of Phase I are to collect, implement, distribute and maintain existing computer aids which meet IREAPS yards requirements for early hull form design.	IITRI	DEC. 1981	

- The Technical Committee--meets at least four times a year to make project recommendations and to direct the conduct of the program.
- Advisory Groups--provide technical guidance to developers on specific projects - established for each major development activity.

FUNDING

The cost of operation of the Institute, the services of technical manager, the IREAPS program and the development projects carried out within the program are shared between the Maritime Administration, other sponsoring government agencies and its industry members.

MEMBERSHIP

IREAPS offers three membership categories:

- Regular Membership--open only to U.S. shipyards
- Associate Membership--open to first-year shipyard members and U.S. organizations "related" to the shipbuilding industry
- Affiliate Membership--open only to educational institutions

A regular member of IREAPS has voting representation on both the Board of Directors and the Technical Committee. The Board of Directors determines the overall policies of IREAPS and the Technical Committee provides direction in the selection of projects aimed at improving shipyard productivity. A regular member can also chair an advisory group whose major function is the management of a specific development project.

Associate and affiliate members are nonvoting participants of IREAPS and as such are not eligible for representation on the Board of Directors or Technical Committee. These memberships were created to accommodate and encourage participation in IREAPS by organizations related to the shipbuilding industry. An associate/affiliate member is entitled to attend various committee and advisory group meetings. Such interaction with shipyard personnel offers IREAPS members the opportunity to form valuable contacts and offers a medium for the exchange of ideas aimed at improving shipyard productivity.

DUES

The yearly fee for shipyard regular member participation in IREAPS is $10,000. First-year shipyard organizations may elect to become associate members for a $5000 fee. Design agents may join IREAPS as associate members for a yearly fee of $5000. Educational institutions may join IREAPS as affiliate members for a $500 fee.

CURRENT PARTICIPANTS

The following organizations are currently members of IREAPS:

Avondale Shipyards Inc
Bath Iron Works
Bethlehem Steel Corporation
General Dynamics
J. J. Henry Company Inc
McDermott Incorporated
National Steel & Shipbuilding Company
Newport News Shipbuilding
Peterson Builders Inc
Todd Pacific Shipyards
University of Michigan

PROCEDURES FOR BECOMING AN IREAPS PARTICIPANT

Joining IREAPS is accomplished by petitioning the Board of Directors for membership in the form of a letter accompanied by the appropriate membership fees. The amount is determined by prorating the appropriate membership type fee on the basis of time remaining in the current fiscal year which runs from October 1 through September 30. For more information contact E. R. Bangs, IREAPS Program Manager, 10 West 35 Street, Chicago, IL 60616; phone 312/567-4608.

SP-4- DESIGN/PRODUCTION INTEGRATION

Thomas O'Donohue
Newport News Shipbuilding
Newport News, Virginia

ABSTRACT

The Design/Production Integration panel was established by the Ship Production Committee of SNAME on April 23, 1981. The panel is the result of the recognition by the shipbuilding industry that design is the first stage of the production cycle. The overall time from award to delivery, cost and quality of the product is largely determined during the initial planning and design stages.

The Design/Production Integration panel provides a needed vehicle for important design and planning involvement in the productivity improvement work of the SNAME/Ship Production Committee. The work of the panel is currently categorized in terms of two programs: Design for Producibility, and CAD/CAM.

PREFACE

The title of the proposed panel has evolved along with the original concept and scope of work.

The initial nomenclatures of "Organization for Production" and "Production/ Engineering Integration" are no longer viable.

The word "organization" has become synonymous with personnel charts to many in the shipbuilding industry. The inordinate preoccupation of the industry with organization structure, rather than integrated functions, is perhaps inevitable considering the frequent reorganizations at the shipyards. The tasks to be undertaken by the panel are functional needs and are independent of shipyard organization. The term "organization" has been discarded.

"Production/Engineering Integration" has been replaced by "Design/Production Integration." Design comes first as the initial step in the production sequence. The "engineering" has been omitted in recognition that engineers are also in production.

Planning for Design/Production Integration would adequately stress the importance of the planning function. Because the need for planning and action is implicit, and again for the sake of brevity, the title has become

Design/Production Integration

Paraphrasing Mr. Wiedenhaefer of Grumman Aerospace during his presentation on CAD/CAM at the Atlanta meeting, the objective is to remove the bar between design and production. Hence, our logo

Design Production
Integration

I. PANEL BACKGROUND AND OBJECTIVES

The National Shipbuilding Research Program was established by the Maritime Administration and the Ship Production Committee (SPC) of The Society of Naval Architects and Marine Engineers (SNAME) following enactment of the Merchant Marine Act, 1970. Provisions of this legislation charged the Secretary of Commerce with the responsibility to "collaborate with...shipbuilders in developing plans for the economical construction of vessels" (Section 212(c)). The shipbuilding industry direction for the program is provided by the Ship Production Committee which is responsible for the cooperative industry program to develop improved technical information and procedures for use by U. S. shipyards in reducing the cost and time of designing and building ships while improving quality.

The need for U. S. shipbuilders to develop an integrated design and production system resulting in lower costs and reduced time between contract award and delivery has been generally recognized. The communication of data on foreign shipbuilding practices through the efforts of the SNAME Ship Production Committee and the Maritime Administration's National Shipbuilding Research Program brought this need into sharp focus. Improvement of the interfaces and communication between design and production is only a partial solution. The need is for full integration of the two functions with design being considered as the first step in the production sequence.

Newport News Shipbuilding (NNS) perceived the need for this important conceptual change in the basic approach to shipbuilding. Research and discussion with our counterparts in all sectors of the U. S. shipbuilding industry confirmed the commonality of the need for design/production integration.

NNS presented a brief paper to the executive committee of the SPC at their meeting in Philadelphia, October 13-17, 1980, to determine if that body considered the subject worthy of a follow-on effort. Consensus approval and a specific directive was given for a conference/workshop to assess the shipbuilding industry's demand for an SPC panel on this subject and to develop a task outline should the demand exist.

The SNAME/SPC conference and workshops were held in Atlanta from January 18 through 21, 1981. Attendance included participants representing 10 shipyards, two universities, MarAd, ABS, National Academy of Science, IIT Research Institute, design agent and consulting firms. The extent of the recognition of the problem and the demand for an industry-wide approach to the solution exceeded our expectations, as did the professionalism and dedication of the participants. Consensus approval of the participants for the necessary industry-wide approach to the subject of design/production integration was certainly provided. The tasks for the proposed panel were outlined and the scope of work considerably broadened. The meeting was a gratifying and learning experience for all who participated. Fig. 1 depicts the primary area of panel activity.

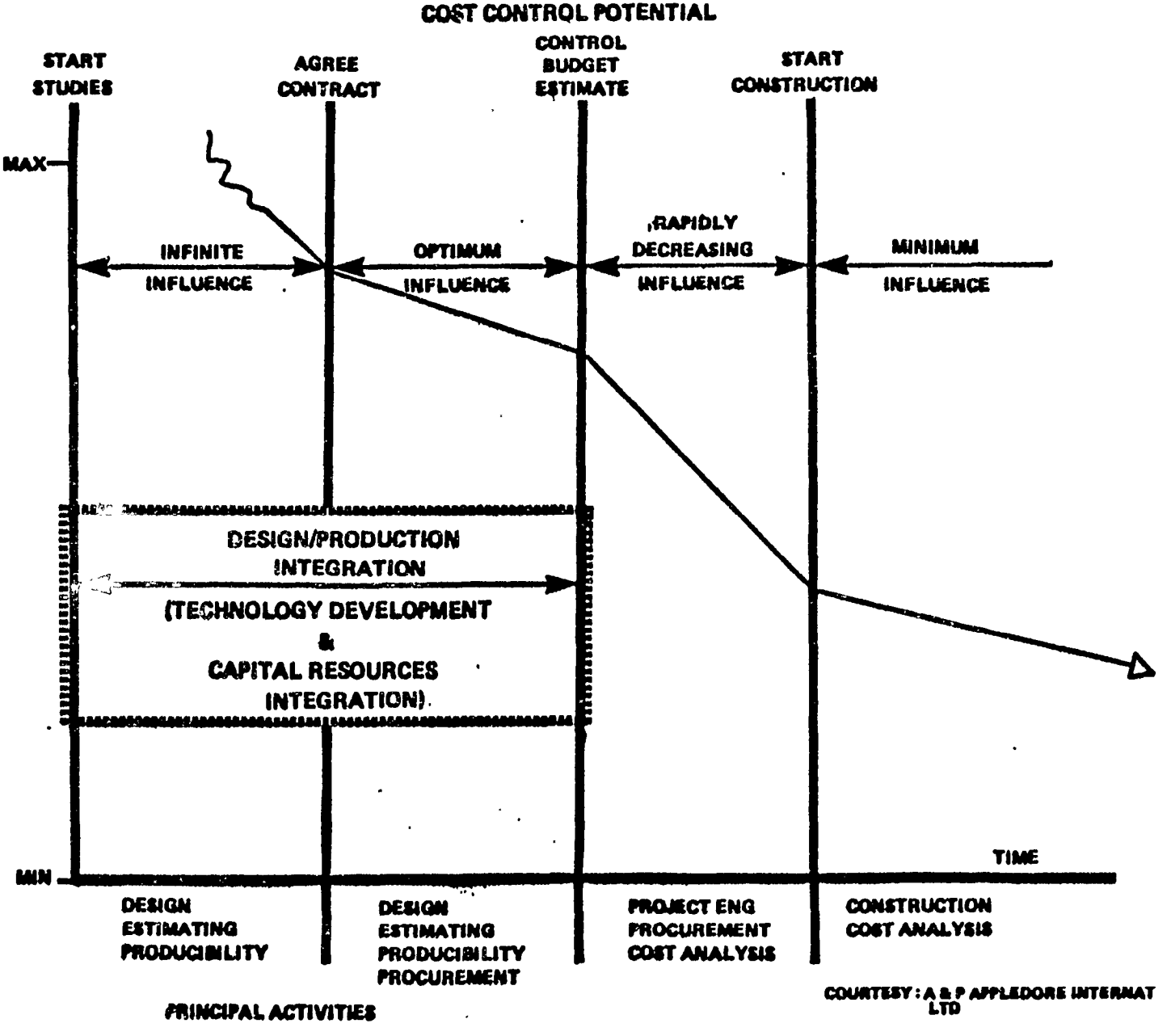
COST CONTROL POTENTIAL
START STUDIES
AGREE CONTRACT
CONTROL BUDGET ESTIMATE
START CONSTRUCTION
MAX
INFINITE INFLUENCE
OPTIMUM INFLUENCE
RAPIDLY DECREASING INFLUENCE
MINIMUM INFLUENCE
DESIGN/PRODUCTION INTEGRATION
(TECHNOLOGY DEVELOPMENT & CAPITAL RESOURCES INTEGRATION)
MIN
TIME
DESIGN ESTIMATING PRODUCIBILITY
DESIGN ESTIMATING PRODUCIBILITY PROCUREMENT
PROJECT ENG PROCUREMENT COST ANALYSIS
CONSTRUCTION COST ANALYSIS
PRINCIPAL ACTIVITIES
COURTESY: A & P APPLEDORE INTERNAT LTD

Fig. 1

The Conference/Workshop proceedings were transmitted to the Ship Production Committee on February 25, 1981.

The Ship Production Committee meeting in New Orleans on April 23-24, 1981 approved the establishment of the Design Production Integration Panel SP-4 with a FY 1982 budget of $400 thousand. (Fig. 2)

II. FISCAL YEAH 1981 ACTIVITIES TO-DATE

The Design Production Integration panel provides a much needed forum for important design involvement in the work of the SNAME/Ship Production Committee. This involvement is inherent in the concept of design being the initial stage of production. The interactive communication between planning, design, and production provides the basis for productive and usable panel output.

The panel is designed for the interaction of owners, governmental departments and agencies, design agents, consultants, universities and, of course, shipyards, resulting in improved producibility, productivity and quality.

The second pre-contract planning meeting of the SP-4 Design Production Integration panel was sponsored by NNS in Atlanta on June 3, 4 and 5, 1981. Thirty-nine (39) participants representing 14 shipyards, the Ship Production Committee, Headquarters Naval Material Command, the Maritime Administration, 4 design agents, 2 universities, 2 consulting firms and an aerospace corporation worked to

INDUSTRY ORGANIZATION

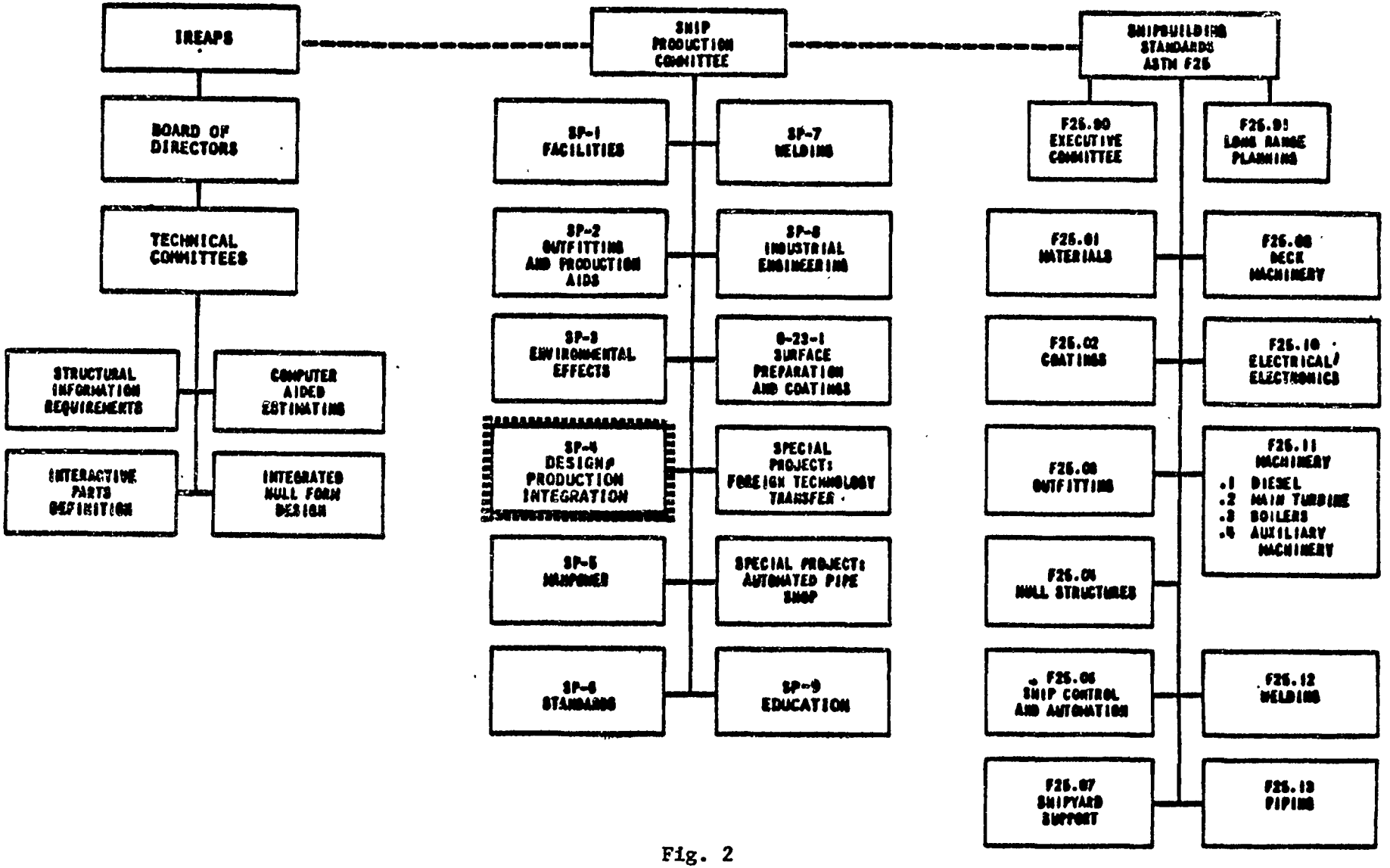

Fig. 2

develop a consensus program. The investment by the industry continues in order that all proposal and subcontract preliminaries may be accomplished prior to FY 1982 funding availability.

An outline of FY 1981 activity to-date is provided in Fig. 3.

SP-4 DESIGN PRODUCTION INTEGRATION

Summary of FY 1981 Actions To-Date

October 13-17, 1980	DPI concepts presented at SPC meeting, Philadelphia
January 18-21, 1981	Design Production Integration Workshop, Atlanta
February 25, 1981	Proceedings of Conference/Workshop transmitted
April 9-10, 1981	SPC Program Chairmen/Managers Meeting, Washington, D. C. - FY 1981 funds not available - FY 1982 budget set at $400 thousand
April 23-24, 1981	SPC established DPI and approved budget
June 3-5, 1981	Design Production Integration Planning Meeting, Atlanta

Fig. 3

III. FY 1982 PANEL WORK PLAN

The FY 1982 plan was further developed at the June 1981 meeting in Atlanta. The work under the Design for Producibility Program has, by consensus agreement of the panel, been subdivided into projects. Each project has been scoped, assigned a tentative budget for the coming fiscal year and been undertaken by an industry project chairman.

The pre-contract investment by the industry continues to prepare the project work scopes and the subcontract proposals pending funding availability.

A. NNS Panel and Programs Management

The program/project management concept is well established at NNS and is supported by competent and dedicated purchasing and contracting departments in addition to financial controls and legal services.

The functional relationships of the panel are depicted in chart form on Fig. 4.

NNS, as the lead yard, will:

(1) provide a program management team to conduct the business of the panel. The program management function will consist of a panel chairman and an SPC program manager.

SNAME/SPC PANEL

ON SHIPBUILDING

DESIGN↑PRODUCTION INTEGRATION

SP-4

FUNCTIONAL RELATIONSHIP CHART

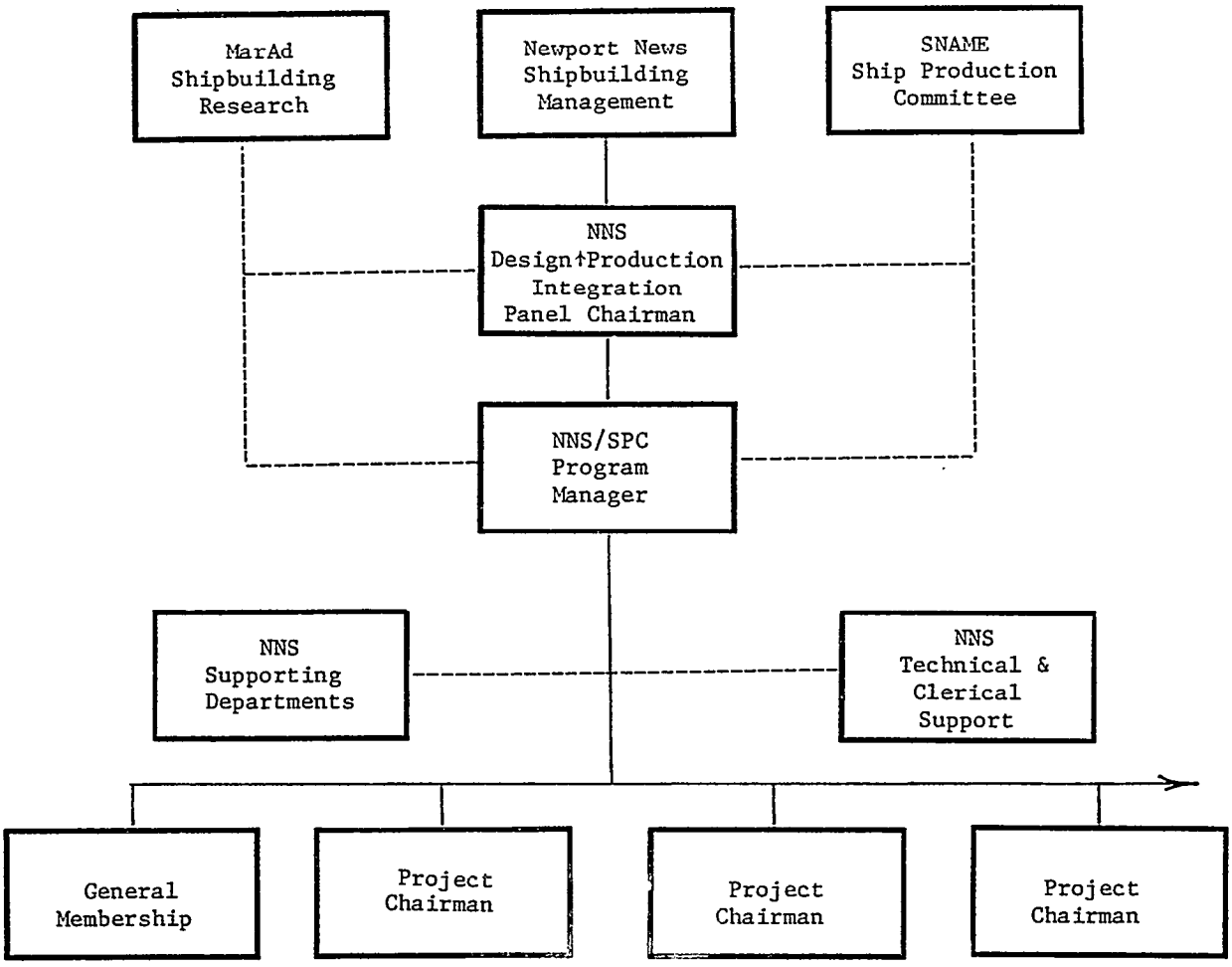

Fig. 4

(2) convene regular panel meetings approximately four times a year or on a quarterly basis.

(3) conduct program and project meetings as the relevant business demands.

(4) work to obtain consensus agreement as to the nature and priorities of the panel's work.

(5) undertake to subcontract work in the pursuit of the agreed upon scope of work of the panel, all in accordance with the terms of the contract including approvals as required.

(6) assess performance of work in progress including on-site investigation as the need dictates.

(7) submit monthly financial reports, formal quarterly progress reports and submit, or cause to be submitted, such other oral and written reports as required by the contract and subcontracts or as needed to further the business and mutual interests of the government departments, the Ship Production Committee and the panel.

(8) cause final reports to be prepared, submitted and distributed at the completion of each project including projected cost benefits as a result of the project completion.

(9) develop, in conjunction with the panel members and others, on-going projects of promising productivity improvement for the benefit of the shipbuilding industry as applicable on an industry-wide basis.

(10) develop suitable and timely budgets for the panel's work within the constraints of funding and implementation capability.

The panel planning meeting provided sufficient project definition and scope to permit project chairmen to be identified and a tentative budget to be assigned to the projects. The project chairmen are now working to further define and refine the projects within the outlines provided. The objectives, technical approach, deliverables, benefits cost and schedule information are to be submitted. A target date of September 15, 1981 for completion of the technical and cost proposals has been set by the panel.

B. Projects

The following projects have been identified for FY 1982 (Fig. 5).

1. Design for Production Methodology - Two projects and one non-project have been identified as part of this task.

   a. Project: Design for Production Manual

      Chairman: R. Ralph, Bethlehem Steel

   b. Project: Design for Production Briefing

      Chairman: A. Kurzenhauser, St. Louis Ship

      Non-Project: Owner/Designer/Vendor Practices Liaison with SP-6/ASTM F-25

      S. Bailey, Avondale

SP-4 DESIGN PRODUCTION INTEGRATION
FY 1982 PLANNED PROJECTS SUMMARY

			Chairman
A.	Panel and Programs Management	$ 83K	T. J. O'Donohue, NNS
B.	Projects		
	1. Design for Production Methodology		
	a. Design for Production Manual	$100K	R. Ralph, Bethlehem Steel
	b. Design for Production Briefing	$ 35K	A. Kurzenhauser, St. Louis Ship
	2. Central Planning		
	a. Engineering Change Control	$ 90K	N. Monk, NNS
	3. Classification/Regulatory Interface	$ 10K	R. Ralph, Bethlehem Steel
	4. Contingency	$ 82K	
	a. Defined Projects Being Developed		
	b. New Projects		
	C. Follow-on Projects		
	Total	$400K	

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Fig. 5

2. Central Planning - One FY 1982 project and several contingency projects have been identified.

   a. Project: Engineering Change Control

      Chairman: N. Monk, NNS

3. Project: Regulatory Body Approvals

   Chairman: R. Ralph, Bethlehem Steel

4. Contingency

   The following subjects were assessed for FY 1982 projects. Due to pending work by other panels or projects, action has been tabled at this time.

   - Central Planning Manual = f (Design for Production Manual)
   - Accuracy Control = f (SP-2 Publication)
   - Standard Nomenclature = f (SP-9)

IV. SUPPLEMENTAL WORK PLAN

One of the highlights of the Design Production Integration Workshop held in Atlanta in January 1981 was a presentation by Mr. Paul Wiedenhaefer, entitled, "The Engineering/Production Integration Process: Graphics, Interactive Computing and Data Base."

The subsequent budget allocation of $400 thousand for FY 1982 seemingly precluded any CADCAM efforts by the panel.

The exchange of information at the Design Production panels at the January 1981 meeting, and at subsequent meetings, revealed the U. S. Navy's rightful interests and concerns in the vital ship design/production relationships and the integrally related computer aided design/computer aided manufacturing aspects of that relationship.

Key representatives of NavMat and NavSea participated in the April, 1981 meetings of the SPC Program Chairmen/Managers in Washington, D. C. and the executive meeting of the SPC in New Orleans at which the Design Production Integration panel was duly established. Headquarters, NavMat was also strongly represented at the June, 1981 planning meeting of the Design Production Integration panel in Atlanta. The Department of the Navy's expressed intent to participate as a full partner and leader in the work of the Ship Production Committee and the SPC Design Production Integration panel was reiterated at the June meeting.

Mr. William F. Holden, Headquarters, Naval Material Command, gave presentations on the Navy Manufacturing Technology and the Navy CAD/CAM programs on the opening day of the June 1981 planning meeting of the Design Production Integration panel. Responding to Mr. Holden's invitation, a planning group for CADCAM was chaired by Mr. David V. Pearson, President of IREAPS. (Note that Mr. Pearson's name has been substituted for Mr. James R. Vander Schaaf, former IREAPS Program Manager and a participant in the planning group, in the following.)

Five CADCAM projects were identified for FY 1982 action and are presented in order of priority. Additional longer term projects were identified but not assigned.

1. Project: Functional Requirements Definition

   Chairman: F. Helming, SofTech

   Budget: $50

2. Project: Initial Graphics Exchange Specification (IGES) for Shipbuilding Data Transmission

   Chairman: D. Pearson, IREAPS

   Budget: $100

3. Project: CADCAM Survey

   - Shipbuilding Industry
     - National
     - International
   - Other U. S. Industry

   Chairman: D. Pearson, IREAPS

   Budget: $200

4. Project: Group Technology Including Part Classification and Coding

   Chairman: F. Posthumus, Todd-Seattle

   Budget: $150

5. Project: Research Standard Software Tools

   Chairman: R. Skirkanich, Grumman

   Budget: $75

0 Non-Projects

- CADCAM Technology Forecast
- Common Data Base/Data Element (DDS)
- Integration Methodologies
- "Shipyards of the Future"
- Simulation and Modeling Technologies
- Decision Support Software
- Assembly Sequencing

v. BENEFITS OBJECTIVE

The objective of the Design Production Integration panel work is directed toward lower overall shipbuilding costs, better quality, and reduced design and construction time between contract award and ship delivery.

The premise of the panel's work is that the initial planning and design actions are the predominant determinants of the final cost, duration of design and construction time and the quality of the

delivered product. The panel is dedicating its efforts to identify the major opportunities and applications of improved technology and methods based upon this important premise.

The work of the panel is to accept the challenges identified as project tasks for industry-wide solutions. The panel is action-oriented toward cost and time reduction with quality improvement through technology, producibility and productivity improvements of the planning, design and production systems with due emphasis on CADCAM.

Each proposed project under the panel programs will need to be justified with respect to anticipated benefits for consensus approval of the panel.

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Appendix A

References: Panel Publications

- Proceedings of the Shipbuilding Design Production Integration Workshop, January 18-21, 1981. Volumes I and II, transmitted February 25, 1981.

- Technical and Budget Proposal for Fiscal Year 1982 generated at the Planning Meeting of June 3-5, 1981, dated June 22, 1981.

SP-6 - NATIONAL SHIPBUILDING STANDARDS PROGRAM

Samuel Wolkow
Project Engineer
Ship Producibility Research Program
Bath Iron Works Corporation
Bath, Maine

This paper will attempt to describe the events that have transpired in the Ship Producibility Research Program since the last report which was given at the REAPS Symposium in October 1980.

PROGRESS HIGHLIGHTS

Since October 1980, SNAME Panel SP-6 met twice; once in February 1981 in San Diego, and the second time in June 1981 in Baltimore. ASTM Committee F-25 also had two regular meetings scheduled; the first one was held in Orlando in December 1980, and the second in May 1981 in Philadelphia.

During the past year, membership in SNAME Panel SP-6 has increased from nine to nineteen active organizational members, including the following new participating shipyards: Bay Shipbuilding, General Dynamics/Electric Boat Co, Ingalls, Lockheed, Marinette Marine, Peterson Builders, and Tacoma Boatbuilding. Voluntary representation on ASTM Committee F-25 on Shipbuilding has increased by 15% (to 175 official members) and continues to show a rising trend in membership status as the standards program achieves greater industrywide acceptance.

At this time, some 70 new shipbuilding standards are being developed under the program involving the activities of SP-6/F-25. Twelve of these are essentially complete, and seven have been formally adopted as ASTM/National Standards. Most significantly, a documented 83% of these new standards have been implemented in new shipbuilding contracts, resulting in an immediate multiple payback situation relative to the initial R&D investment. Several shipyards are now involved in new or expanded internal standards programs,

particularly in cases where advanced shipbuilding techniques such as on-block/on-unit outfitting, accuracy control, etc., are being applied.

U.S. Navy support of, and participation in, the standards program has become even more pronounced in the past year, notably through the efforts of RAdm E. J. Otth, Naval Sea Systems Command, Deputy for Acquisition and Vice-Chairman of Committee F-25, up to his retirement in June 1981. His successor as Deputy for Acquisition at NAVSEA, RAdm J. W. Lisanby, has indicated his intention to provide the same degree of involvement and participation. RAdm Otth's replacement as Vice-Chairman of Committee F-25 is RAdm T. M. Hopkins, who is currently the Naval Sea Systems Command Deputy Commander for Ship Systems. The first ASTM shipbuilding standard has already been incorporated in the Navy GENSPECS, and formal procedures have been established to ensure ongoing Navy assessment of these commercial standards for Navy use. This trend toward cooperative standardization is expected to continue and even increase.

In summary, a year ago it was observed that the standards program was about to enter the second phase of evolution following the 1977/1978 implementation. At this point it is fair to state that this effort has successfully overcome initial resistance and start-up problems, and is recognized as an essential component of the current shipbuilding technology/productivity improvement thrust. By the end of this year, a formal long-range plan for shipbuilding standardization will be published, outlining specific priorities for both industrywide and individual shipyard programs.

CURRENT PROGRAM STATUS

The current status of SP-6 MarAd funded projects is summarized in Table 1.

SNAME PANEL SP-6 FY-82 PROGRAM RECOMMENDATIONS

The FY-82 Standards and Specifications program recommendation represents the consensus priorities of the SP-6 members as determined at the February 1981 meeting and reaffirmed as to specific subcontract accomplishment at the June 1981 meeting. Two-thirds of the proposed efforts are being undertaken by new SP-6 members participating in such work for the first time.

The FY-82 project recommendations listed below are intended to support ongoing progress in the standards program and provide a bridge to implement

projects in new areas based on known priorities and anticipated recommendations of the U.S. Shipbuilding Standards Long Range Plan. Two of the FY-82 projects will be funded at a later time using FY-81 special funds and reallocating budget underruns on completed work.

TABLE 1

Proiect Title	Objective	Status/Comments
Shaft Alignment Standards	Develop standard procedures and documentation for: (1) geared steam turbine, inboard shafting; (2) diesel, outboard shafting; and (3) geared steam turbine; outboard shafting.	Complete and in ASTM review
Weld Defect Tolerance Study	Develop rationale for reduced rework/repair through engineered standards.	Complete. Commercial report published 6/l/80. Navy report published 3/81. Follow-up planned.
Mechanical Design/ Construction Stds.-Groups I & II	Develop initial standards for common items.	Complete Many items already in use.
HVAC Design/ Construction Standards	Develop initial standards for common details.	70% complete
Outfit Design/ Construction Standards	Develop initial standards for common items.	60% complete
Standard Specification for Piping Systems	Update and revise MarAd Standard Schedule (2-69)	10% complete. Limited effort to date.
Shipbuilding Standards Long Range Plan	Development of clear program priorities.	Contract signed w/IHI Marine Technology 3/81 & will complete 12/81.
Mechanical Design/ Construction Stds. - Group III	Development of standards for additional common items.	Work started 7/81
QA/QC Acceptance Standards	Identification/development of priority cost saving standards.	Work started 5/81.

1. Plan Submittal/Approval Cycle

Development of this task is tentatively being deferred pending issuance of a USCG NVC intended to implement a memorandum of understanding between the USCG and ABS covering transfer of certain design and inspection functions from CG to ABS. The effective date of the NVC was targeted for August 1, 1981.

2. Standards Program Sound/Slide Documentary

This is intended to be a 15-minute presentation of the standards program in general and the long range plan in particular to promote industrywide support and participation. The documentary could be made available throughout the industry to promote and publicize the scope, goals and accomplishments of the standards program and to emphasize the actual and projected benefits which can result.

The following projects were recommended by Panel SP-6 for FY-82 funding:

1. Standardized Purchase Inquiry & Bid Response Sheets

Tacoma Boatbuilding Co. has submitted a proposal defining the scope of work necessary to accomplish this task. Basically, this project is intended to provide standardized parameters for defining operating and performance characteristics of main and auxiliary equipment and for developing a standard format for the review and evaluation of bid responses.

2. Mechanical Design/Construction Standards - Group IV

Bath Iron Works will continue development of a comprehensive set of standards for commonly used items such as foam and fire station cabinets, standard thermometer selection chart, standard gage selection chart, shot blast procedure for descaling the interior of steel pipe, strainers, flanges, striker plates, and flanged tube ends.

3. Navy GENSPEC Review

John J. McMullen Associates has submitted a proposal to conduct a professional review of NAVSEA 0902-001-5000, "General Specifications for Ships of the U.S. Navy". The purpose of this review will be to identify specific priority areas where naval and commercial standards/ specifications can be improved, consolidated, or interchanged.

4. Functional Design Standards

John J. McMullen Associates has also submitted a proposal to develop functional standard drawings for subsystem components which should result in production capability improvement through utilization of zone outfitting and outfit package concepts which are non-shipyard unique. Four subsystems are included in this initial effort. They include: multistage flash distilling plant; geared steam turbine lube oil unit; fuel oil service unit; and ships service air compressor unit.

5. Long-Range Plan Implementation - Phase I

This project is intended to provide immediate funding for implementation of high priority recommendations resulting from the U.S. Shipbuilding Standards Program Long Range Plan in advance of FY-83.

6. Hull Desisn/Construction Standards - Group II

This task was intended to develop a second set of standards for commonly used hull items such as: watertight life jacket stowage lockers, fire station arrangements, deck stands, floodlight foundations, and ductwork penetration details, among other candidate priority items.

7. Special Development Project Funding

To provide funding for short term, high priority special efforts such as studies, workshops, consulting services, etc.

ASTM COMMITTEE F-25 UPDATE

As previously stated, the fifth regular meeting of Committee F-25 was held in May 1981 in Philadelphia. The special feature of this meeting was a workshop which was organized to provide a forum for the Vendor/Supplier community to address the problem of improving the marine equipment supplier productive capability and developing industrial standards to reduce shipbuilding costs and schedule durations for simplifying procurement and design submittal procedures; and for assuring greater reliability and maintainability of subcontractor's products.

The motivation for this workshop was the concern of many owners and operators of merchant marine and particularly naval vessels over difficulties they were experiencing in obtaining major and auxiliary machinery components

to adequately support ship construction, operation, and maintenance requirements, with the degree of reliability and continuity upon which the shipbuilding industry depends.

Fleet operators are alarmed at the apparent erosion of the Vendor/Supplier industrial base. This is of special interest to the Navy Department, whose plans for extensive fleet expansion can be seriously jeopardized by excessive costs of subcontractors' products affecting the affordability of ships.

Ninety-four industry representatives from over forty major equipment supplier and manufacturing companies attended the workshop. They heard nationally recognized experts from all sections of the shipbuilding industry discuss the marine equipment supplier problem from various perspectives. Later, the attendees met in special groups covering the following categories:

Main and Auxiliary Propulsion Systems
Electrical/Electronic Equipment
Hull Mechanical/Deck Machinery
Regulations/Administrative Requirements

In general, the following topics were among the major problems discussed:

1. The need to simplify purchasing and plan approval procedures.

2. The need to reduce manufacturing lead times for critically needed equipment.

3. The need to establish multi-year procurement practices to ensure a vibrant, constant market for equipment suppliers,

4. The need to develop commercially oriented GENSPECS to minimize the dependence on military or federal material specifications.

5. The need to establish a uniform standard identification system for spare parts replacement, especially for equipment from other than the original manufacturer.

6. The need to provide definitive performance criteria and operational characteristics in purchase specifications.

7. The need to discourage continual re-design of frequently used equipments which have proven satisfactory service experience under operating conditions.

8. The crucial need to improve the adversary relationship between producer, builder, and owner.

WORKSHOP CONCLUSIONS

As was to be expected, both favorable and negative comments resulted from the working sessions. At the plenary session held on the second day of the workshop, the following general observations were expressed:

1. The need for greater accountability, reliability, producibility, and maintainability of subcontractors' products.

2. The need to develop effective procedures for productivity management.

3. The need to reduce government regulations.

4. The need to establish inducements or initiatives to encourage vendor/supplier involvement in developing industry standards.

5. The need to improve government/industry interface problems.

6. The need to study the impact of standards implementation on new contracts.

7. The problem of addressing preventative measures in liability for subcontractors.

Favorable comments originating from the working sessions included the following:

1. Builders/Owners want to avoid using costly custom designed equipment.

2. The desire of all interested parties to restore the competitive position of the U.S. shipbuilding industry.

3. The use of different materials for identical components clutters and complicates the supply system.

4. Working within the ASTM organizational structure ensures a program of periodic review, maintenance and updating of all standards.

Critical comments against the Vendor/Supplier community's participation in the standards program included:

1. Industry prefers to use existing standards as much as possible.

2. Existing industry standards could be used if government requirements were relaxed.

3. There are a sufficient number of applicable industry standards currently available to satisfy users' requirements.

4. Dimensional standards are too limiting and restrictive for the marine equipment supplier industry.

5. Standards such as the IHI (JIS) specifications are too detailed.

6. Equipment suppliers are worried about antitrust actions.

7. Concerns about the government's (Navy) commitment to use commercial standards.

In summary, the workshop's stated objective of enlisting industry support to develop an integrated approach to the National Shipbuilding Standards Program was considered productive. It was the concensus of the workshop participants that if the U.S. Shipbuilding Industry is to achieve productivity equality with foreign shipyards, standardization of subcontractor's products will be an essential component for improving the industry's competitiveness in world markets.

FUTURE PLANS

The Vendor/Supplier workshop was the third in a series of such conferences organized by Committee F-25. The first two involved the Shipbuilders and Owner/Operators, respectively.

A fourth workshop for Naval Architects/Design Agents is being planned for the May 1982 meeting which will be held in Philadelphia.

The committee's sponsorship of these workshops is part of an innovative program to draw previously uninvolved owners, builders, suppliers and designers into the standards program to achieve a truly integrated industrywide effort in this endeavor.

Thank you.

SP-8 - SHIPBUILDING INDUSTRIAL ENGINEERING PROGRAM

Joseph R. Fortin
Project Engineer
Ship Producibility Research Engineer
Bath Iron Works Corporation
Bath, Maine

SNAME Panel SP-8 was established in 1978 to act as the shipbuilding industry's steering committee for a national industrial engineering effort. Presently, the panel's 18 members represent both large and small U.S. shipyards. The panel is also supported by members of professional organizations and academia, e.g., American Institute of Industrial Engineers, University of Massachusetts, Georgia Institute of Technology and others. Panel SP-8 is currently involved in Phase II of a multiphased program designed to increase productivity through the application of industrial engineering techniques.

PHASE I

Briefly, Phase I of this program was implemented in late 1979 under the title "Shipyard Methods/Labor Standards Development Program". There were two primary goals established for this phase: (1) to improve methods and develop engineered standards, and (2) to increase shipyard management awareness of the potential benefits available through the use of basic industrial engineering techniques. Six shipyards actively participated in this program, received formal work measurement training, and began improving methods, creating engineered standards, and formally documenting their progress in the form of work management manuals. These manuals included standard practices and policies, equipment used, layout and material flow, manual methods used and other information supporting the engineered labor standard. Phase I produced 10 such manuals for publication and distribution through the industry in the following work areas:

- Pipe Shop
- Blast and Coat Shop
- Hull Erection
- Steel Shell Assembly
- Steel and Aluminum Small Assembly, Bulkheads, Webs
- Foundations
- Panel Line
- Panel Assembly on Platens

. . . and two general shipyard manuals

Each of the six yards documented initial savings of between 15% to 40% in methods improvements alone during this first phase. Specific areas improved upon were shop layout, material flow, crane utilization, replacement of out-dated manual machinery with new, more efficient machinery, and many other somewhat obvious changes requiring minimal capital investment. In several of the yards, actual audited savings exceeded the initial R&D investment less than 1 year following project completion (noting that these improvements are cumulative, accrue immediately, and will apply to all future work).

The second primary goal of increasing shipyard management awareness of the potential benefits of using industrial engineering techniques was successfully accomplished by the presentation of 15 executive briefings to middle and upper shipyard managers throughout the country. These briefings, prepared and presented by the American Institute of Industrial Engineers for Panel SP-8, were extremely well received. To follow up these briefings, a series of Production Control Workshops, intended to acquaint these same shipyard managers with the benefits of standards application in the planning, scheduling and production control areas of the shipyard, were delivered to the majority of yards. This concluded Panel SP-8 Phase I activities.

PHASE II

With Phase I successfully completed and a long range Industrial Engineering Program Plan in place, Panel SP-8 began Phase II of the Methods/Labor Standards Development Program in April of this year. Under the guidance of the Maritime Administration and with the consensus of Panel SP-8 membership, objectives for this Phase II effort were defined as:

- Continue methods improvements
- Continue standards development
- Continue education of shipyard personnel in I.E. techniques
- Define areas of shipyard standard data application
- Test and evaluate the computerized "MOST" (Maynard Operational Sequence Technique) System. . . the time measurement system being used to develop our engineered standards

Specifically, there are five shipyards actively participating in the funded portion of this program. A project team from each yard was formally trained in the use of the MOST Computer System and returned to their respective yards to apply this training in the development of engineered labor standards. Five new areas of the shipyard were selected for coverage during this phase. The yards and areas of involvement are:

- Bath Iron Works - Main Assembly Area
- Peterson Builders - Electrical Shop/Installation
- Newport News - Blast & Paint on the Dock and Platens
- Bethlehem Steel/Sparrows Point - Staging
- National Steel & Shipbuilding - Plate Shop

As in Phase I, each yard is responsible for thoroughly documenting all project activities and reporting their results to the panel. Continued savings are anticipated throughout this phase due to the implementation of improved methods and equipment.

Another important element in this phase of the program is the testing and evaluating of the MOST Computer System. Our approach has been to utilize this system as a group of users, maximizing the information available by cross-sharing and reducing the expense of computer time and storage. This will be explained in much greater detail by the H. B. Maynard & Co. consultant to our program, Mr. Lou Kuh.

The third and probably the most significant element of Phase II is the definition of how these standard data are to be applied in each yard. Prior to completion of this phase, each participating yard is expected to have identified and demonstrated on a trial basis, that application of engineered standards in their chosen area is feasible and cost effective. It should be

pointed out that utilization of standard data within each shipyard is not to be viewed as a revolutionary new technique. The concept is to simply use the accurate, quantitative data, developed and maintained by industrial engineers, to the maximum benefit of the shipyard.

In addition to the application of standard data for improving production methods and processes, several other functional applications are being considered. These are broken down into three basic functional areas:

1. Industrial/Manufacturing/Production Engineering

   a. Methods improvement
   b. Tool, equipment & machinery evaluation
   C. Facility layout, flow & workplace arrangement
   d. Productivity improvement, i.e., delay identification & elimination
   e. Manload balancing - critical path determination
   f. Labor incentive systems
   g. Make/buy analysis
   h. Long-range facilities planning

2. Production

   a. Supervisory control
   b. Manpower distribution & assignment
   C. Labor performance reporting & analysis
   d. Productivity improvement, i.e., identification of delays, interferences & inefficiencies.

3. Production Planning, Scheduling & Control

   a. Labor budgeting
   b. Shop scheduling
   C. Critical path development
   d. Material requirements planning
   e. Group technology (process lane) planning
   f. Estimating

Another new area being addressed as a special project during Phase II is the development and presentation of a formal Methods Engineering Training Program. Designed to be an intensive, 5-day workshop to train shipyard

representatives as instructors in basic Methods Engineering, the American Institute of Industrial Engineers is putting together a thorough training package, tailored exclusively to shipyard application. Upon completing this course, the trained instructor will have all the basic knowledge and materials necessary to establish an in-house Methods Engineering Program.

PHASE III AND BEYOND

In 1982, Panel SP-8 efforts will be primarily focused on standard data application. A more detailed look at Methods Engineering and Material Planning and Control will also be on the agenda for action items. As progress is made and results documented, the panel will move into the more advanced industrial engineering aspects, i.e., group technology, information systems, operations research, etc.

CONCLUSION

Panel SP-8 on Industrial Engineering is and has every right to be proud of their accomplishments to date.

SP-7 - SHIPYARD WELDING

B. C. Howser
Newport News Shipbuilding
Newport News, Virginia

ABSTRACT

The Welding Panel SP-7 was formed in recognition of the fact that reduction in welding time and improvement of welding quality would reduce the cost of building ships and allow U.S. shipbuilders to remain competitive in the world market. The panel provides opportunities for member organizations to propose and implement projects which examine existing welding technology for improvement and adaptation to shipbuilding and research and development of new technology which advances the state of the art in shipbuilding welding.

Currently, active projects include 'Visual Inspection Standards for Welds Not Requiring Other Inspection", "Robotics in Shipbuilding", and "Shielded Metal Arc Welding Against Ceramic Backing". Proposed projects include "Multiconsumable Guide Electro-slag Welding", "Aluminum Welding in Shipbuilding", and "Fitting and Fairing Devices".

Hello!- I am B.C. Howser of Newport News Shipbuilding and I am Chairman Elect of the SNAME SP-7 Welding Panel. Over the next few minutes I would like to bring you up to date on the WHAT, WHY, WHO and HOW'S of the SP-7 Welding Panel. Contrary to what you might have been led to believe, because of someone's comments or because of the panels recent management inactivity, SP-7 is alive and well. The inactive status has been the result of the time required to transfer the panel management from Sun Ship, Inc. to Newport News Shipbuilding. This has involved the lawyers, contract administrators and bean counters of three organizations - Sun Ship, Newport News and MARAD and as they all have told me on many occasions "THESE THINGS TAKE TIME!"

What is the SP-7 Panel? Why does it exist?

The SP-7 Panel is a productivity improvement panel whose membership is dedicated to the improvement and advancement of welding technology in U.S. Shipbuilding. It functions through joint industry - government (Maritime Administration) cooperation under sponsorship of the SNAME Ship Production Committee.

"Improve on the things we are currently doing and develop NEW and BETTER ways of performing in the FUTURE while maintaining or improving quality,"

Less Cost

No other US industry is as heavily committed to the welding process as is shipbuilding. The welding activity and its support functions represents a large (if not the largest) direct labor cost within a shipyard. It is therefore considered essential that the objectives of the SP-7 Welding Panel be directed toward support of projects which will reduce cost by improvement of existing processes, materials, techniques, and equipment and the development of new methods, materials and equipment which will decrease welding time while maintaining or improving weld quality.

Who is the SP-7 Welding Panel?

The Panel currently has 23 members who represent many different organizations that are in someway involved with welding in shipbuilding; these organizations are as follows:

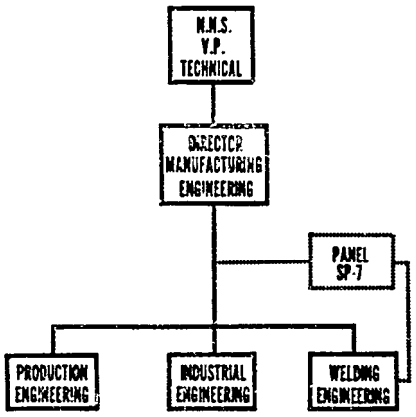
MEMBER ORGANIZATIONS
SP-7

AMERICAN BUREAU OF SHIPPING	INGALLS SHIPBLDG.	NORFOLK NAVAL SHIPYARD
AVONDALE SHIPYARDS INC	LEVINGSTON SHIPBLDG.	NORFOLK SHIPBLDG
BATH IRON WORKS	MARITIME ADMINISTRATION	OFFSHORE POWER SYSTEMS
BAY SHIPBLDG. CORP.	NATIONAL STEEL & SHIPBLDG.	PETERSON BUILDERS
BETHLEHEM STEEL-SHIPBLDG.	NAVSEA	SUN SHIP
GENERAL DYNAMICS SHIPBLDG.	NEWPORT NEWS SHIPBLDG.	TODD SHIPBLDG. CORP.
U.S. COAST GUARD		

Membership is selected by the panel and anyone here today who feels they are directly involved with welding in shipbuilding is invited to submit their name to the group for consideration.

Under the current contract with Newport News Shipbuilding the management of SP-7 is performed by B.C. Howser, Panel Chairman and M.I. Tanner, Project Manager, who together bring to the panel 50 years in welding experience and management.

SP-7
MANAGEMENT



As you can see, panel management is directly responsible to the Director of Manufacturing Engineering, who also has Welding Engineering, Industrial Engineering and Production Engineering reporting to him who in turn reports to the Vice President, Technical. These individuals along with other top management officials of our company have pledged full support to the activities of the SP-7 Welding Panel.

How does a project get implemented?

Future projects which are submitted by member and interested non-member organizations are reviewed and selected by vote of the panel membership. After approval by the panel the organization which has submitted the proposal will then enter into a sub-contract agreement with Newport News Shipbuilding for funding of the project.

As previously stated, Newport News has taken over the management of a program previously implemented by Sun Ship, Inc. There are six (6) specific projects which have been identified, four (4) of which have been sub-contracted and two (2) which have not yet been formally committed.

Current Proiects

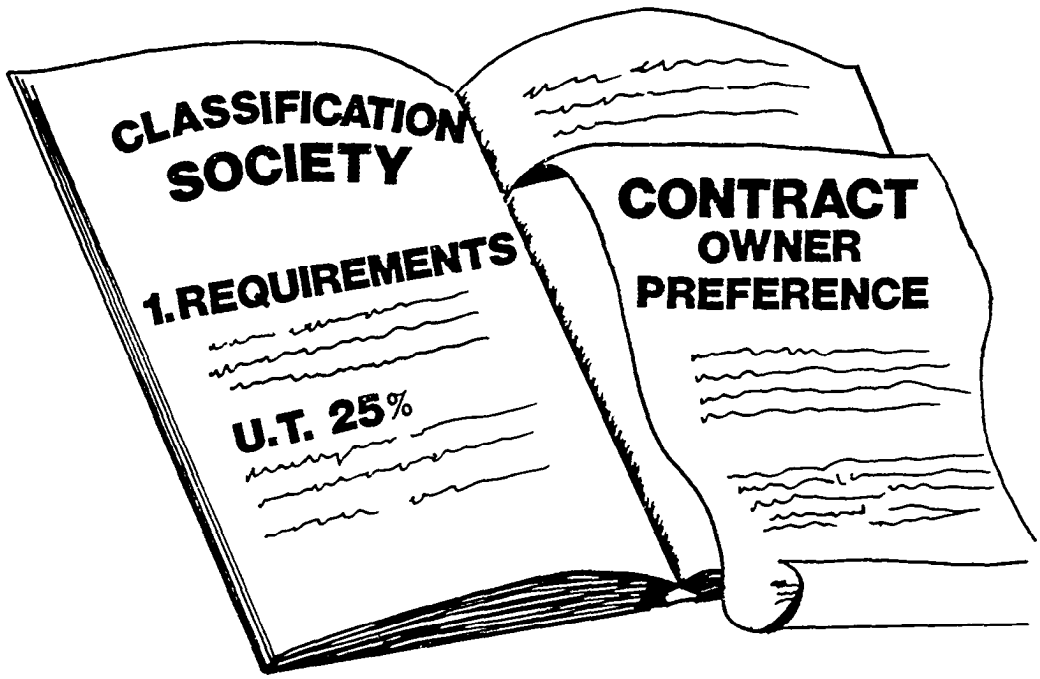
CURRENT PROJECTS

- ACCEPTANCE STANDARDS FOR NONDESTRUCTIVE TEST NOT REQUIRED BY CLASSIFICATION
- PLASTIC WELD MODELS-VISUAL REFERENCE SIANDARDS FOR WELD SURFACE APPEARANCE
- SHIELDED METAL ARC WELDING OVER CERAMIC BACKING
- CINCINNATI MILACRON T³ ROBOT
- UNIMATION APPRENTICE ROBOT
- FITTING AND FAIRING DEVICES
- SPECIAL STUDIES

Acceptance Standards for Nondestructive Tests Not Required by Classification - Phase I - Ultrasonic Test - Sub-Contractor - American Bureau of Shipping

In new construction shipbuilding, ABS Rules for Nondestructive Inspection of Hull Welds require ultrasonic tests for full penetration welds in the midship such as intersections of butts and seams in the bilge strakes, sheer strakes, deck stringer and keel plates and butts in and around hatch corners. These required inspections have specified well defined acceptance standards. Other

inspections are sometimes performed for shipyard internal quality control and to satisfy contractual agreement for owner requested inspection. These inspections, which are beyond classification society requirements, do not have established acceptance standards.



The objective of this project is to establish guidelines to determine at what point weld defect indications in full penetration welds are considered insignificant or at what level the indication could cause the structure to be unreliable.

Plastic Welding Models - Visual Reference Standards for Weld Surface Appearance - Sub-Contractor - American Bureau of Shipping

VISUAL INSPECTION WELD SAMPLES

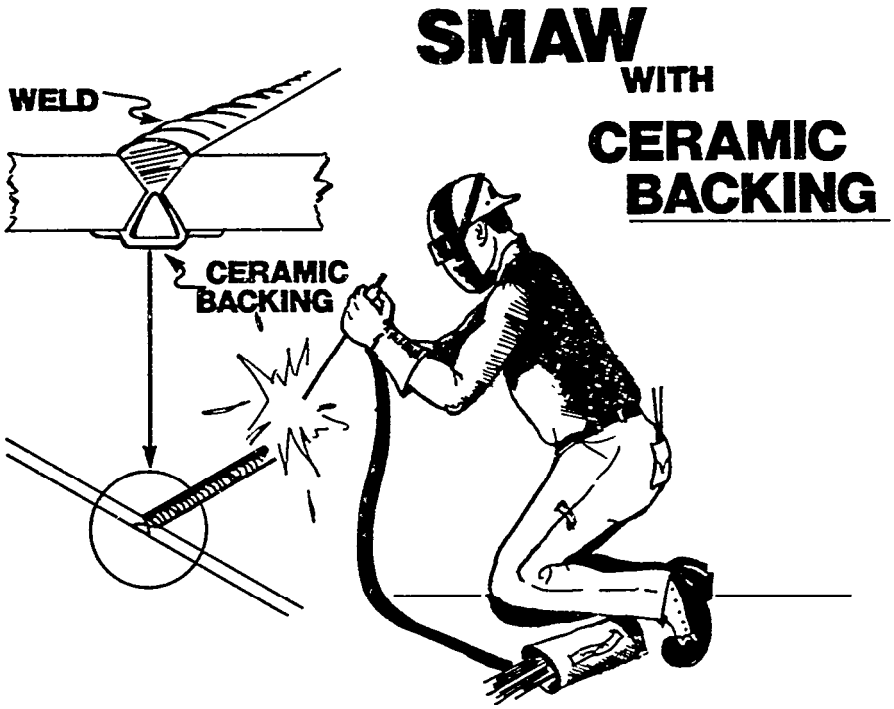
Written acceptance criteria for visual inspection of welds in the shipbuilding industry have proven too vague to avoid differences in interpretation and the members of the SP-7 panel expressed a need for more specific visual reference standards.

VISUAL INSPECTION WELD SAMPLES

The objective of this project is to obtain weld samples containing various levels of surface roughness, undercut, porosity, overlap, etc. which would serve as the basis for the manufacture of plastic models which could be made available as reference standards for use by shipyards, shipowners and inspection personnel.

Shielded Metal Arc Welding (SMAW) Over Ceramic Backing - Sub-contractor - Offshore Power Systems

The use of ceramic tile backing in conjunction with shielded metal arc welding continues to increase due to its ease of application and economic advantages. In the developing technology, new and improved equipment and products have entered the market place. Refinements in techniques and application have become so sophisticated that one manufacturer markets a complete ceramic system comprised of ceramic tiles, specially formulated low slagging electrodes and ultra-hot-start alternating current welding systems.

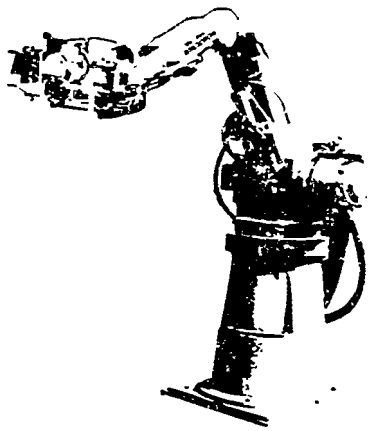


The objective of this project is to perform a state of the art evaluation of the techniques, equipment and parameters to SMAW over ceramic tiles. The evaluation will include a number of different brands of tiles, including one foreign brand which will be evaluated along with magnetic and adhesive backing systems.

Industrial robots are used throughout the world in manufacturing operations that are monotonous and boring, too hazardous and in some cases, uneconomical for humans. One of the most promising areas for development today lies in adapting industrial robots to shipbuilding welding. This appears to be possible if the problem of consistent close tolerance fitup is solved, or if a system is developed that will precede the robot welder which will "read" the joint and make the necessary adjustments for varying fitups. The SP-7 panel has funding allocated for two robot projects:

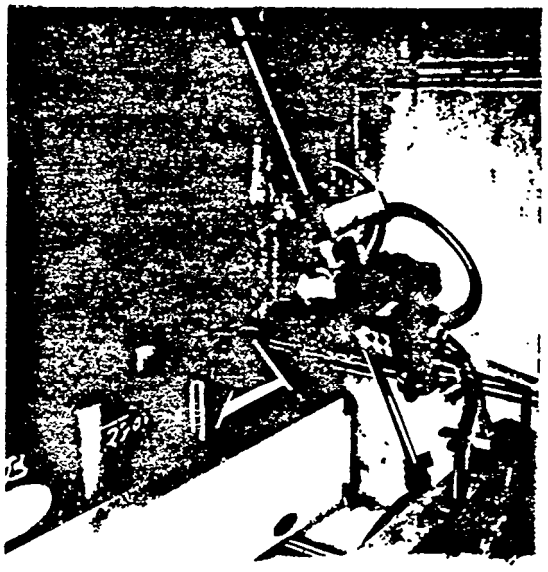
Cincinnati Milacron T^3 Robot - Sub-Contractor - Todd Shipbuilding, Los Angeles

CINCINNATI MILACRON T^3 ROBOT



Funding has been allocated for the twelve month rental of a CMT[3] robot welder to evaluate its ability to perform repetitive welding jobs in a regular production environment. The T[3] is a stationary welding system which has the possibility of being applied to some of shipbuildings many shop welding jobs (pipe, hangers, collars, etc.).

Unimation Apprentice Robot Welder - Not committed

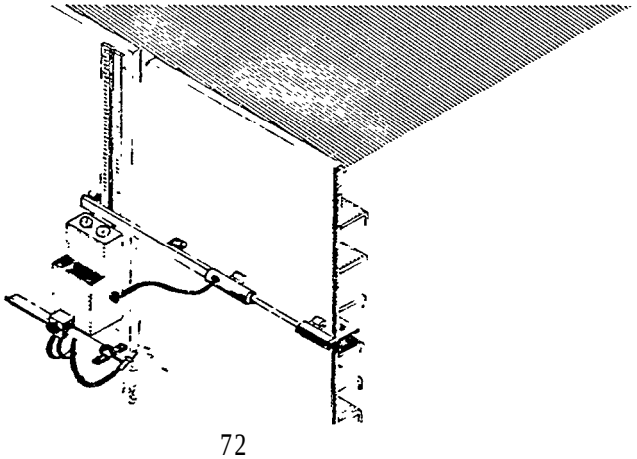


UNIMATION APPRENTICE ROBOT WELDER

The Apprentice robot welder is identified as a portable welding system in that it can be taken to the work, rather than the stationary type which requires that the work be brought to it.

The objective of this project is to acquire an Apprentice robot welder, which has been done, and evaluate its performance in a shipyard, both under laboratory and production conditions, as to its dependability, ease of handling, positioning and productivity. At present, there is no sub-contractor for this project, but Ingalls Shipbuilding is very much interested in undertaking this task.

"Fitting and Fairing Devices" - Not committed



Successful automatic welding is dependent on consistent close tolerance fitup, which is generally not found in ship hull construction today, due in part to the lack of attention which has been given to fitting and fairing devices.

The objective of this project is to search for and/or develop fitting and fairing devices that can be used in conjunction with automatic welders and robot welders to provide the consistent fitup that they require. Avondale Shipyard, Inc., New Orleans, LA and National Steel and Shipbuilding Company, San Diego, CA have both expressed an interest in undertaking this project.

Special Studies

This represents an account which contains funding that can be allocated to special projects which might develop during discussion at our panel meetings or submitted at sometime during the contract period.

Future Projects

FUTURE PROJECTS

- **ULTRASONIC TEST EQUIPMENT DEVELOPMENT**
- **ALUMINUM WELDING**
- **MULTI-CONSUMABLE GUIDE ELECTRO-SLAG WELDING**
- **TRACKING SYSTEM FOR ROBOTS**
- **MOLDABLE PADS FOR ONE SIDE WELDING**
- **SPECIAL STUDIES**

A request has been submitted for funding for the following projects:

Ultrasonic Testing Equipment Development

A project which will involve the use of electromagnetic acoustic transducers which are sensitive to horizontally polarized shear waves. It is predicted that this (NDE) method when developed could significantly improve the speed and reliability of ships' hull inspection.

Aluminum Welding

Development of techniques and procedures which could minimize distortion of the aluminum base material during welding. This project would include but not be limited to investigation of heat input control, cooling rates, thickness requirements and welding sequence.

Multi-Consumable Guide Electroslag Welding

The objective of this project is to develop the multiple consumable guide electroslag welding process/technique for joining 4" thru 24" thick carbon steel castings. Shipbuilding application of this process would be directed toward joining rudder arms, shafts, strut arms, shoe castings and other items which have not been feasible to cast in one piece.

Tracking System for Robot Welding

The development of a tracking sensor, using infra-red light which would read variations in the joint fitup and transmit essential changes to the welding system. Such a tracking system appears to be the key factor for successful introduction of Robot welding in shipbuilding.

Moldable Pads for One Side Welding

This project is to evaluate the feasibility of a "putty like" moldable pad which is a flux and wire composite designed to accomodate the high arc force associated with one side submerged arc welding. Successful results could significantly improve the productivity of one side welding by elimination of the gas metal arc (Mig) weld passes now being used to cushion the force of submerged arc welding.

Special Studies

As previously stated this account is to provide funding for support of useful projects which might develop during the course of the contract period.

Newport News Management Philosophy for SP-7 Panel

NEWPORT NEWS MANAGEMENT PHILOSOPHY
FOR
SP-7 PANEL

- PROMOTE PRODUCTION EFFECTIVE PROJECTS
- ENCOURAGE TOTAL MEMBERSHIP PARTICIPATION
- SOLICIT SHORT AND NTERMEDIATE RANGE PROJECTS
- OBTAIN MAJORITY VOTE FOR PROJECT APPROVALS
- COLLECT AND DISTRIBUTE ACCURATE DESCRIPTIVE AND TIMELY REPORTS

Promote Production Effective Projects

Seek productivity improvement projects which will later be implemented in the shipbuilding fabrication industry and not just become the basis for a fancy bound report which will gather dust on the bookshelves of our technical libraries.

Encourage Total Membership Participation

Assure that panel membership is submitting proposals, providing written response to panel correspondence and attending scheduled panel meetings.

Solicit Short and Intermediate Range Projects

Obtain short range (less than one year) and intermediate range (two years or less) programs which can be defined, developed and utilized in shipbuilding production.

Obtain Majority Vote for Project Approvals

The major responsibility of members of the SP-7 Panel is to define, approve, initiate and direct the welding research projects.

Collect and Distribute Accurate, Descriptive and Timely Reports

Make sure that each report has the details of the development of each project which would permit the reader to implement its use and at the same time understand the advantages which would be realized.

O-23-1 - SURFACE PREPARATION AND COATINGS

John W. Peart
Research & Development Program Director
Avondale Shipyards Inc
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The keynote of this conference is INCREASED PRODUCTIVITY IN SHIPBUILDING.

With this thought foremost, I'd like to first "overview" the National Shipbuilding Research Program; and then discuss more specifically its recent efforts in the area of Surface Preparation and Coating.

The very first point I'd like to make about PRODUCTIVITY IN SHIPBUILDING, however, concerns a sea turtle.

Scientists at the Charles Darwin Research Station in the Galapagos Islands recently reported that a sea turtle had fallen in love with a rock! The scientists alleged that the turtle had been observed regularly, passionately attacking the rock (which, to some degree, resembled a sea turtle). That frustrated turtle seems in the grip of some profound learning experience that holds a couple of clear lessons:

Lesson 1 - Effort and results are not necessarily related; and

Lesson 2 - It is awfully important to be discriminating in one's choice of targets!

The American shipbuilding industry has recognized the turtle's first lesson: that intense applications of labor may not bring about effective and satisfying results -- and in fact "labor without logic" may merely waste man-hours. Giving careful attention to the necessary logic, the U.S. shipbuilding industry undertook a cost-shared Research & Development Program with the Maritime Administration to find more cost-effective ways to produce ships.

I believe the National Shipbuilding Research Program has mastered Lesson 2 as well. Since its inception, it has been careful and discriminating in its target selection from a wide range of possible areas for investigation and

implementation. Those targets that have been chosen, however, show a pattern of positive change, real results, and productivity improvement.

One factor important to the Program's success must be recognized: the participation in problem definition and program selection of the Society of Naval Architects and Marine Engineers' Ship Production Committee and its Subcommittees.

I refer specifically to the 023-l subcommittee.

Although doubtless other program managers would say the same for their committees, shipyard participation and interest in this particular subcommittee, the 023-1, has been excellent; the attendance and contributions of the members have been outstanding. This means management sees the usefulness of the programs. Why is this so? Because the participants are accomplishing something more important than just program identification. They are also communicating with management, whose implementation of programs "in yard" has resulted in real cost savings.

With regard to the National Shipbuilding Research Program, I believe there's a general awareness of two facts which I'm going to mention anyway:

> First: the Program is facing some budget constraints at the present time;
>
> Second: the Department of the Navy -- recognizing the importance of higher shipbuilding productivity in building a stronger fleet -- is now participating in the National Shipbuilding Research Program, as well as initiating an active manufacturing technology program of its own.

This alliance is warmly welcomed.

Despite any rumors to the contrary, we shipbuilders have always shared two common interests with the Navy - ships and women.

We're now following those common interests with joint efforts: efforts to achieve desired results at lower cost, (where SHIPS are concerned, that is. I'm not sure what anybody can do about the cost of women.)

Any approach to cost-effectiveness in building ships must include Surface Preparation and Coating as one factor to take into account. Justified attention has been given this topic from the Program's beginning. Since

that time, however, there has been a changing emphasis indicating a growing sophistication of method, and maturity of approach.

The first Surface Preparation and Coating projects were basic methods-and-materials guides with a definite "how-to" emphasis; HANDBOOK OF SMALL TOOLS FOR BLASTERS AND PAINTERS, and SURFACE PREPARATION AND COATING OF SHIP TANKS.

These initial guides made clear, however, a need for personnel training, especially supervisory training, for blasting and painting operations. Subsequently, programs were set up to meet the indicated training needs, with good results.

We next became concerned about the climate of ever-increasing local and federal regulations and their possible cost impact on coating and blasting operations. This concern generated such reports as CITRIC ACID CLEANING and HIGH SOLIDS AND WATERBORNE COATING EVALUATIONS.

The importance of appropriate standards as a vital aid in lowering surface preparation and coating costs also became apparent, resulting in PRACTICAL SHIPBUILDING STANDARDS FOR PREPARATION AND COATING, and EDGE PREPARATION STANDARDS.

This brings us up to the present, when a high level of interest in Japanese shipbuilding technology is promising to have a large impact on our own "state of the art". Japan's emphasis on neglected areas such as Standards Establishment; Zone Planning; Materials Control; and Worker-Oriented (as opposed to Task-Structured) work systems -- all these give us new, international research avenues that could have a very high payoff. We are presently looking at Japanese surface preparation and coating operations to see how they compare in productivity to our own surface preparation and coating methods and practices.

CURRENT RESEARCH

I'd now like to comment on several interesting developments which have occurred as a result of our research efforts. One specific research focus has been on Abrasive Quality.

Various abrasives -- sand, steel grit, coal slag, etc. -- are used in surface preparation because of their relative effectiveness in cleaning a

surface prior to coating. A few variables, should be looked at, however. And a few cautionary notes apply.

In our investigation of citric acid cleaning, for example, an interesting sidelight occurred while blasting panels for coating application with various abrasives: rapid re-rusting of the coal slag abrasive-treated surfaces was noted. In fact:

- After 2 hours laboratory storage ambient conditions approximately 70°F 55% RH, the coal slag abrasive-blasted panels were already turning. (The grit-blasted and sand-blasted panels remained comparatively stable.)

- After 24 hours, surface oxidation on the coal slag abrasive-blasted panels was extensive (again contrasting to the more stable panels blasted with grit or sand). Subsequent testing of water leachings from the abrasives verified high chloride contamination. Investigation of the manufacturing process indicated that the power plant producing the raw material was quenching the slag in water with a high salt content.

As a direct result of these occurrences, a program was set up whereby abrasives are being investigated and evaluated by source, as well as on the basis of availability, quality, etc.

The results will be incorporated in an industry Abrasive Specification through ASTM Committee F25.02.

Wax-Based Semihard Coatings are another current research target.

Microcrystalline wax-based semihard coatings find successful use as tank coatings for water immersion service. They have the advantage of being able to be applied over light, tightly-adhered rust, additionally offering good blister-free corrosion protection when applied in sufficient thickness. Our program comparing the economics of these coatings with anodes, epoxy tank coatings, partial coatings with anodes and cathodic protection alone revealed that some of these are not compatible with cathodic protection.

Since failure was noted very quickly in additional tanks, it was decided that generic wax-based materials from two different supply sources be screen-tested. Screen-testing of the second of the two supplier's products displayed a mode of failure previously observed: coating failure due to spalling and lack of adhesion.

[NOTE. When ongoing research produces a direct dollar benefit--that's not really news. Research is supposed to pay for itself, after all: cash-effectiveness is its very dynamic. Still: The value of tests such as those described above had a dramatic impact on one major new construction yard holding production contracts specifying wax-based coatings in ballast tanks, with anodes. This yard was represented on subcommittee 023-1, however. Given early access to data emerging from the tests, this man alerted his yard in time to avert a coating process that seemed certain to bloom into massive, costly, multiple! coating failures! Instead--again benefitting from ongoing research, the yard circumvented a potentially serious problem by removing, or masking, the specified anodes.]

Also under study is Calcite Coating of Tanks.

We are all familiar with calcite coating as the white deposit seen on bare areas of underwater hulls, cathodic protected. The sight indicates a working system: the hull is being protected.

A similar coating is applied in water mains to protect them from corrosion by flowing a saturated calcium carbonate solution through them.

It became apparent that if this coating could be applied to salt water ballast tanks, it would provide a cost-effective means of corrosion control. Thus an investigation into the deposition parameters was begun.

The investigation was unable to apply an adequate calcite film under diffusion-limited quiescent conditions. Considering the large potential cost savings involved, further investigation is planned. Spray application; forced agitation; A/C current; and chemical additives are among methods to be explored.

The goal of the Zone Oriented Surface Preparation and Coating Process Planning program is to identify the differences in coating systems, process and planning methods between the Japanese and U.S. shipyards, and provide procedures for integrating cost-effective methods in U.S. shipyards. (This program has been subcontracted to IHI and Chugohu Marine Faint, Ltd.)

To provide finer definition of program objectives and method of information transfer, Gerald Soltz and I toured selected Japanese shipyards and blasting and coating contractors earlier this year. Dr. Soltz will be presenting some of his observations in some detail at another conference session -- one I personally think well worth attending.

NOTE. A comprehensive report on Japanese Shipbuilding, which will expand on remarks given at this conference by Dr. Gerald Soltz and Mr. John Peart, should be available by late January 1982.

Those interested in receiving a copy of this report should contact: John W. Peart, R & D Program Manager, Avondale Shipyards, Inc., P.O. Box 50280, New Orleans, Louisiana 70150.

On the same general subject, however, I'm going to limit myself to a few summary remarks in the time remaining.

I would consider the following to be among the most obvious Japanese shipbuilding "success factors":

1. Detail Planning and Integration with Ship Construction and Scheduling.

   Surface preparation and coating are treated as equal in importance with hull construction and outfitting: and addressed in every phase of the ship construction sequence.

   Pre-Contract Negotiations
   Engineering
   Cost Control
   Materials Control (paint quantity; need dates)
   Outfit Scheduling (on unit; on block; on board)
   Dry Docking.

2. Accurate Measurement and Documentation of Man-Hours and Materials.

   Precise cost of labor and materials are determined and documented. This serves two purposes: first, it provides accurate data for cost estimation in future contracts; and, more importantly, if actual costs exceed estimated ones, a "flag is raised"; and a timely inquiry can uncover the causes responsible for escalating costs! (Lessons learned in this process of inquiry, by the way, should make cost overruns on future projects less likely!)

3. Selection of Paint Systems Compatible with Construction Methods and Schedules.

4. Good Specification Definition.

Little is left for interpretation and argument. Application parameters and quality standards are defined.

It seems that I have just finished presenting another LIST -- in this case, a list of factors which Seem relevant to the question of productivity.

We've heard a lot about productivity, certainly; we've heard numerous phrases describing it: worker-oriented phrases such as "quality circles", and systems-related terms such as zone planning and product/work structures.

But more basic than any of these (though perhaps including all of them), is an underlying goal I believe we all share. No matter what our specifics or specialties, I think that on a broad general level we share a notion of just what we'd like to achieve together; and that is, simply: the application of logic to this business of shipbuilding.

NATIONAL SHIPBUILDING RESEARCH PROGRAM

PUBLISHED REPORTS

(1) Handbook Small Tools for Blasters and Painters

This report defines the principles required for efficient blasting and painting. Specialized cleaning methods from power tool cleaning to closed cycle blasting are discussed, equipment and facilities are described and cost reduction procedures are defined.

(2) Practical Shipbuilding Standards for Surface Preparation and Coatings

This effort developed: (1) proposed "Shipbuilding Standard for Surface Preparation and Coating" and (2) a "Standard Paint and Coating Product Data Sheet" and identified the need for a preconstruction conference between the shipyard production and technical sections, the owner representatives and the coating supplier.

(3) Marine Coating Performance for Different Ship Areas

A computer program was developed to compare the effectiveness of the different generic coatings in the different ship areas. The trends indicated by the program were supported by prefailure analysis test results.

(4) Cleaning of Steel Assemblies and Shipboard Touch-Up Using Citric Acid

This program confirmed the compatibility of citric acid cleaned surfaces with the present state of the art marine coatings; optimized the cleaning solution and procedure and confirmed the feasibility of a Phase II study.

(5) Shipyard Marking Methods

This program identified a marking material meeting the necessary requirements of a durability and overcoatability with marine top coats.

(6) Training Course for Blasters and Painters and Student Handbook

Thirty-six (36) shipyards have participated in the instructor training program.

(7) Standard Procedure for Determining Volume Solid

This program attempted to develop a procedure to determine the volume solids of liquid coatings based on a uniform film thickness measurement. It was unable to obtain accuracy and precision equivalent to the present ASTM procedure because of the inability of casting a uniform thick film. If the ASTM procedures is used, some heat must be applied to the curved film to obtain a constant weight. This temperature should be agreed with between supplier and purchaser if an accurate coverage rate is to be obtained.

8) Evaluation of Near Solventless Coatings

This program compared available near solvent free coatings with available "State of the Art" Marine Coatings. The coatings were exposed to testing conditions representative of the different ship areas. Many of the coatings performed as well as conventional systems but usage in certain ship areas would be limited because of application requirements and build characteristics.

(9) The Feasibility of Calcite Deposition in Ballast Tanks as a Method of Corrosion-Control

This program evaluated the parameters required for the deposition of thick calcite coatings on steel substrate from low concentration of collodial calcium carbonate. This coating in conjunction with anodes would provide an economical means of corrosion protection in ballast tanks. Heavy coating deposition was obtained but solution agitation or flow was required. Phase I of the program will attempt to provide a practical method of initiation compatible with the complex configuration of ballast tanks.

REPORTS IN PUBLICATION

(1) Surface Preparation and Coating of Tanks in Closed Areas

(2) Survey of Existing and Promising New Methods of Surface Preparation

(3) Evaluation of Waterborne Coatings

PROGRAMS IN PROGRESS

(1) Rust Compatible Primers

(2) Cathodic/Partial Coatings vs. Complete Coating in Tanks

(3) Comparison of Surface Profile Measuring Methods

(4) Reclaimation of Mineral Abrasives

(5) Zone Planning of Surface Preparation and Coating

(6) Abrasive Survey

PROGRAMS TO BE SUB-CONTRACTED

(1) Edge Preparation Standard

(2) Marine Coating Performance for Different Ship Areas - Phase I

* If copies of reports are desired please contact:

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SP-9 - EDUCATION

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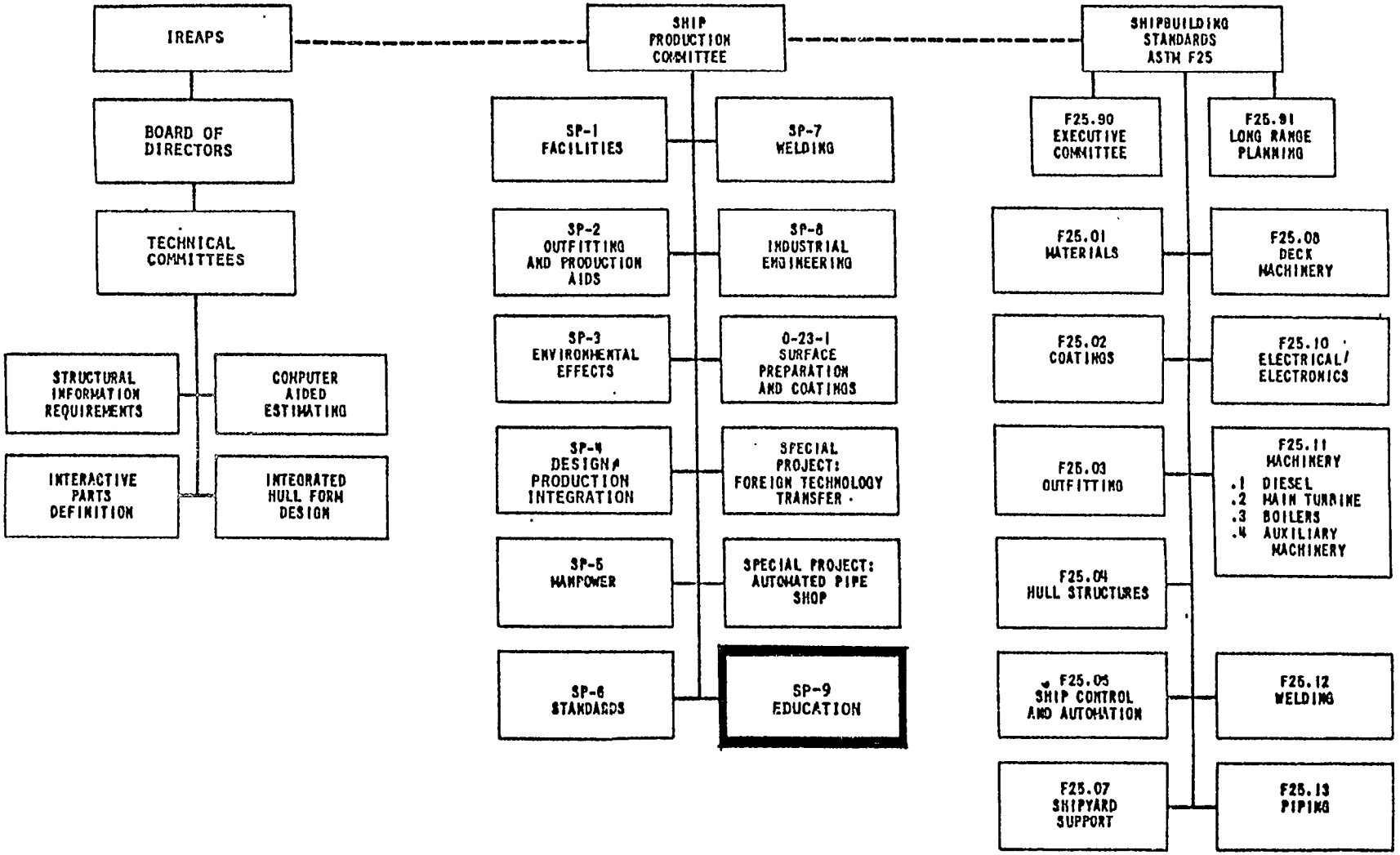
Department of Naval Architecture and Marine Engineers
University of Michigan

The Panel's purpose is to coordinate the development and emplacement of programs for education in the range of technical skills.required to improve shipyard productivity. This includes technician training, middle management refresher training, and higher education initial-entry professional training.

The panel was established in May 1981, and has held a workshop to develop a program for the 1982 fiscal year. The projects proposed activities are in the three areas mentioned in the preceding paragraph.

NATIONAL SHIPBUILDING RESEARCH PROGRAM
INDUSTRY ORGANIZATION



SHIP PRODUCTION COMMITEE

EDUCATTON PANEL

HISTORY

* * *

ESTABLISHED IN APRIL, 1981

* * *

PURPOSE IS TO DEVELOP AND MAINTAIN EDUCATIONAL PROGRAMS RELATING TO THE LATEST TECHNOLOGY IN SHIP PRODUCTION AND PLANNING, SPECIFIC AREAS OF CONCERN ARE:

- SKILLED TRADES TRAINING
- PRE-ElTRY PROFESSIONAL TRAINING
- MIDDLE MANAGEMENT REFRESHER TRAINING

*** *** ***

FIRST PANEL WORKSHOP HELD IN AUGUST, 1981

*** *** ***

20 ATTENDEES FROM

- 7 PRIVATE SHIPYARDS (AVONDALE, BATH, BETHLEHEM LOCKHEED, NEWPORT NEWS NORSHIP, TODD)
- 1 NAW SHIPYARD (NORFOLK)
- 3 GOVERMENT OFFICES (MARAD NAVMAT, NAVSEA)
- 3 UNINERSITIES (MICHIGAN, SUNY, WEBB)
- 1 NON-PROFIT INSTITUTE (IRAPS)

*** *** ***

45 PROGRAMS CONSIDERED

8 ACCEPED

300^{K} BUDGET

EDUCATION PANEL
PROPOSED BUDGET LOCATION FY 82

	($000>
SKILLED TRADES TRAINING	45
PRE-ENTRY PROFESSIONAL TRAINING	90
MIDDLE MANAGEMENT REFRESHER TRAINING	1oo
ADMINISTRIION	65
TOTAL BUDGET	300

EDUCATION PANEL
SKILLED TRADES TRAINING

- COMMUNICATE NAVSEA PROGRAMS PRIVATE SHIPYARDS — $20K
  (INFORM PRIVATE U.S. SHIPYARDS OF THE EXISTANCE OF ME NAVSEA TRAINING PROGRAMS; SURVEY PRIVATE YARDS FOR THEIR TRINING NEEDS, AND FORWARD TO NAVSEA FOR USE IN THEIR PROGRAM PlANNING)

- CATALOGUE OF TRAINING PROGRAMS — $25K
  (COMPILE A DIRECTORY OF TRW-SKILLS TRAINING ACTIVITIES AND MIDDLE-MANAGEMENT TRAINING ACTIVITIES USED IN U.S. SHIPYARDS)

$45K

EDUCATION PANEL
PRE-ENTRY PROFESSIONAL TRAINING

- CURRICULUM DEVELOPMENT — $30K
  ANALYZE AND IDENTIFY CLUSTERS OF SKILLS AND KNOWLEDGE REQUIRED FOR ENTRY INTO SHIP PRODUCTION, DEFINE THE MORPHOLOGY OF SHIPBUILDING TECHNOLOGY. PROVIDE SUPPORT FOR FACULTY ASSIGNMENT PROVIDE SUPPORT FOR ESTABLISHING PROFESSIONAL AWARDS ON SHIP PRODUCTION)

- SHIP CONSTRUCTION TEXT AND CASE STUDIES MANUAL — $45K
  (PREPARE UNIVERSITY-LEVEL TEXT BOOK ON SHIPBUILDING PROCESSES, DEVELOP CASE STUDIES TO ILLUSTRATE TECHNOLOGY OF PRODUCTIVITY).

- CLASSROOM MODELS — $15K
  .(DETERMINE WHAT TYPES OF MODELS ARE APPROPRIATE FOR ClASSROOM USE, DEVELOP PLAN FOR PLACING MODELS INTO CLASSROOM).

$90K

EDUCATION PANEL
MIDDLE-MANAGEMENT REFRESHER

- ADVANCED TECHNOLOGY SHORT COURSE — $ 35K
  CONDUCT Two SHORT COURSES ON CONCEPTS OF ADVANCED TECHNOLOGY IN SHIP PRODUCTION, PREPARE VIDEO TAPE OF COURSE AND EDIT FOR USE IN SHIPYARDS>.

- QUALITY CIRCLES — $ 45K
  (PREPARE AND PRESENT TO SHIPYARD MANAGEMENT A PRESENTATION ON QC SYSTEMS, PRESENT TWO ONE-WEEK TRAINING PROGRAMS FOR FACILITATORS, PREPARE VIDEO TAPES FOR REFRESHER USE).

- TECHNIQUES OF SURFACE PREPARATION AND COATING — $ 2o K
  (REPEAT FOR AN EXPANDED AUDIENCE THE TRAINING PROGRAM DEVELOPED IN 1979 BY PANEL 0-23-1),

$100K